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EDITORIAL NOTES.

Jubilee of the North of England Gas Managers' Association.

THERE were rejoicings, congratulations, good wishes, a looking back, and a glance forward in one small part of Newcastle-upon-Tyne last Thursday. It was the occasion of the Jubilee of the North of England Gas Managers' Association; and for it men gathered from all parts of the vast area comprised in the membership of the Association. To this anniversary meeting, marking fifty years of co-operative service, bravely came one of the founder members—Mr. James Whyte, of Seaham Harbour—bearing well his ninety years, and alert to all that was passing, much of which was reminiscent of the days of fifty years ago, and of professional associates all but three or four of whom have gone hence. There was also Mr. M. Richley, of Shotley Bridge, who was an original member, and who (if we can believe the Jubilee President, Mr. Herbert Lees, Assoc.M.Inst.C.E., J.P.) simply refuses to get old, or, at any rate, to show the years that have passed. Others were there who were formerly professionally engaged in the district—notably, Mr. Doig Gibb and Mr. Thomas Hardie—whose work now lies in other highly responsible spheres. The President of the Institution of Gas Engineers (Mr. John Wilkinson) travelled from Nottingham to offer his congratulations, and to wish the Association "God-speed." The programme for the day had been well arranged by the President, the Committee, and the Hon. Secretary (Mr. Norman S. Cox); and chaste mementoes of the occasion are the jubilee brochure (the contents of which were reproduced in our columns last week) and the menu card for the luncheon. We heartily congratulate the officers and members of the Association upon the success of the meeting, and upon the new memories which it created.

It was fitting that Mr. Herbert Lees should be the President in this Jubilee year, for his intimate connection with the work of the organization, in official capacity and as an ordinary member, carries back his recollection of men and matters farther and more exactly than can be the case with other members. No greater honour could the Association have done him; and his acceptance of the position, with its greater responsibilities in this red-letter year, was an honour to the Association. For the meeting he prepared a special address, which took us back through time to the founder members and their doings—men whom some of us knew, men whose names we honour, men who did their good part in reinforcing the foundations and fabric of the industry, men whose lives and activities in the industry left it better than they found it. Lingering over a number of the names that are marshalled by the President in the address, we reflect that, while every one of them served well the undertaking to which he was called, each in some way left distinctive marks and influences which still make their names household words among us. We talk much of co-operation in the industry in these days. It is no new thing. This Association (as others which have passed their jubilee year) shows how the men of half-a-century ago believed in professional co-operation and conference, not so much for their own personal advantage, as for that of the industry generally, and that co-operation was then, as now, between men in lowly and high places of responsibility in the industry. Beneath those silk hats and frock coats in which they were wont to attend their meetings, there was the sense of a professional brotherhood and a higher industrial objective, which, with all our advances in co-operative work, is not to-day excelled in sincerity.

The address carries us on to some of the outstanding features of the contributions which have been made, through the Association, to the literature and knowledge of the gas profession; and a wealthy store it makes. It reviews, too, the material progress of the industry which shows its vast expansion, and, in accord with the nature of things in an industry in which many minds and energies have been brought to bear upon the provision and distribution of its services, the greater economy with which its work is now done. In tables and in the text of the address, Mr. Lees has carefully emphasized these things—in respect of capital, consumers, consumption, and the greater availability of the service. In Table I. he has worked out the percentages of increase or decrease between 1882 and 1925—the nearest years to the fifty years' span for which figures are at hand. Those showing increase speak of the robust progress of the industry, as does the decrease in the capital expenditure per unit of output. There is one figure in the table which, unless there is reference to a later part of the text, may not appear so good. That is the fact that in 1925 the average sale of gas per consumer was 14·53 p.ct. lower than in 1882—32,407 c.ft., compared with 37,917 c.ft. This, of course, is due to the introduction and growth of the prepayment meter system, which brought the beneficial services of gas within the reach of sections of the community who previously were unable to participate in them. But we have long since passed the lowest point in the curve of average consumption, and, as Mr. Lees indicates, it has been ascending for some time, and will ascend still more until the average of the ordinary consumers in 1882 will be exceeded by the average of ordinary and prepayment consumers combined. The rate of the return climb is exemplified by the fact that between 1921 and 1925 the average consumption per consumer rose from 30,208 c.ft. to 32,407 c.ft. With a return to normal charges the average figure will, despite the prepayment class of consumer, again reach that of 1882, in which year the total gas sold was 66,613,944,000 c.ft., compared with 265,757,353,000 c.ft. in 1925, which is an increase of 299 p.ct. In the circumstances of the period since 1914, there is good ground for satisfaction over the steady rise in the average sale per consumer.

The enlarged opportunities, the greater advantages, and the far-reaching and powerful organization which we enjoy to-day compared with the day of the foundation of the North of England Gas Managers' Association, are all set out in the address. We have largely consolidated the power and influence of the units of the industry in organizations to advance and protect its valuable interests; we have blended science with practice; we have united (in a considerable proportion of the industry) the interests of the workers and the employers; we have provided for better training in the technical and commercial work of the industry for those who are moving forward to the higher positions in its work; almost universally ideas have grown more catholic and comprehensive. It is all very necessary. Our industry has changed, and is still changing, with the times; and we see upon the horizon new growths in responsibility and duty for the men who will succeed us. We are inspired by the example and work of the men who held office in the industry in less pro-

pitious, if also less onerous, circumstances, but who encountered boldly those troublesome times in the early 'eighties, when people began to think gas was doomed, and could not foresee that by 1925 its gas business alone would have increased by only a shade less than 300 p.ct. Since then the gas industry has not allowed to escape its attentions any opening which, exploited, would be of advantage to it. And as the prospect is viewed, it is seen that the scope for the men of the industry was never greater than it is to-day. "A great heritage," said Mr. Lees, "has been left to us; and the responsibility devolves upon us to pass it on to our successors adequately supplemented in proportion to the superior advantages under which we work."

We cordially congratulate the North of England Association upon its fine history, as so excellently and in choice language portrayed by the President; and in wishing the members a large success in the future, we cannot do better than quote the words of the address: "If we face the "future with the same enthusiasm and determination that "characterized the work of those who founded this Asso- "ciation, the next fifty years will see other problems "solved, and further progress achieved beyond the dreams "of the most imaginative among us. This, then, is the "task which lies before us. It provides opportunity for "the genius of the inventor, the research work of the "chemist, the technical skill of the engineer, the best "qualities of salesmanship, and the highest administrative "abilities." Let us add—while we are utilizing the opportunities which the internal characteristics of the industry offer, sight must not be lost of the many influences which are operating outside it, but which may affect its interests—whether for permanent good or otherwise is a matter for the keenest watchfulness and, where it may be necessary, counteractive measures.

Waterless Holders—Requirements of Customers.

The Ipswich Gas Company have always, since the birth of co-operative work in the industry, been associated with it, and with all its advances. As we glance back through Time's avenues, the names of Chairmen and Engineers who have taken prominent part in the affairs and progress of the industry are recalled to mind. Goddard, Woodall, and Jolliffe are to gas men names which signify good work. The Eastern Counties Gas Managers' Association have ever found Ipswich and the administrators and chief officials of the Company among their best friends; and more than once they have had the pleasure of being their guests. Men may come, and men may go; but there is no change in this respect in the county town of Suffolk. The members had the felicity of again being received by the Chairman (Mr. Henry Woodall, M.Inst.C.E.) and their President (Mr. Frank Prentice) last Thursday; and a right memorable day they had, as is shown by the report of the day's proceedings, as published in later columns.

At the business meeting, the principal feature was the Presidential Address of Mr. Prentice. In the forepart, he treated of commercial and managerial problems; in the latter part, with the question of waterless holders, of which, as is well known, an example is being constructed at the Company's works. If it had been, without aught else, to inspect this new feature in gas engineering, the visit would have been worth while to the members. We will allude first to this part of the address. The President mentioned the disadvantages of the old types of holder—the servants of a century. The enormous weight of water, necessitating foundations of great strength and solidity; the liability of the water in the tanks and lutes to freeze in wintry weather; and the variation of pressure caused by the lifts cupping and uncupping, were cited against them. With all their faults, we love them still; for by their aid the gas industry has built up a fine reputation for constancy of supply. But regard for good service must never be allowed to stand in the path of progress, so long as there is care that what is termed progress is worthy of the name. As we said recently, tankless holders have come to stay; but it is uncertain whether the original principles in respect of interior organism will be maintained. We cannot believe that the present form represents finality. New invention—even in gasholders—may produce conditions which eliminate old disadvantages, and set in their place new advantages, but which nevertheless may be accompanied by disadvantages which were not present in the old type. It then becomes a question of cost in relation to the superiority of advantage in performance. We do not see that the President specifically refers to a single material disadvantage of the waterless type as at present constructed. What is done in the address is to accompany a general description with a statement regarding its accomplishments.

However, as to cost in construction. It is obvious to anyone that the cost of the foundations of the new type of holder must depend on the character of the subsoil, and on the situation and exposure of the vessel itself; for much depends on the maintenance of level and the rigidity of the structure (under the varying conditions of sometimes a full column of gas under pressure, and at other times the holder only partially filled, with the upper part empty) to ensure the smooth working of the piston. Cost applies not only to the initial expenditure, but to the day-by-day operation. If the perfect working of the holder necessitates more supervision than the old types, that is not obtained for nothing. Much depends, too, upon the automatically operated pumps round the holder for the service of the seals; the attention to, and maintenance of, the pumps are not obtained for nothing. Such matters must be considered in fairness to the old as well as to the new form of holder; advocacy must not be allowed to magnify on the one hand, and minimize on the other. The President also speaks of the tar seal serving three purposes. The integrity of the tar seal, like the level working of the piston, is vital. Its primary purpose is the prevention of leakage. The President says the Posen disaster was due to several causes. That the holder was of an early type is admitted; that the disaster happened, proves possibility. That it is not the only waterless holder in which there has been leakage past the seal is well known, even though there may not have been a disaster. The constitution of the tar for the seal is carefully prescribed for very good reasons; the "M.A.N." investigators are still, after a decade, carrying on research to ascertain whether improvement cannot be effected in the sealing liquid. That is, of course, a perfectly sound proceeding; but it shows that there is not complete satisfaction with the prescription as it stands to-day. The President speaks of the liability of the water to freeze in the tank and lutes in the telescopic types of holder; if there is not care with the constitution of the sealing liquid in the new holder, there may, in severe weather, not be the absence of trouble which inferentially is suggested in the address. We do not call attention to these matters in a derogatory spirit; but simply to point the fact that, if there are disadvantages in the old types of holders, there are problems and features connected with the new form, which are not exactly describable as constituting perfection. A strong point in favour is the uniformity of the pressure given by the waterless type of holder, providing pumps, seal, and piston are all in good working order. It is also obvious that, given no trouble, the upkeep expenditure of the shell itself must be considerably less than with the predecessors. If the gas which leaves the holder is also drier than that from a water-tank holder, that too is an advantage. But with a water-tank holder with an oily film on the top of the tank water, there should not be any material addition of moisture to the gas. Perhaps Mr. Prentice will later on give exact information as to the difference; meanwhile, the point is referred to in an article on "Dry Gas." However, we hope that all that is anticipated from the new holder at Ipswich (which is expected to be completed in July) will be fully realized.

Returning to the forepart of the address which deals with commercial matters, it may be summed-up by saying that the President's view is that the surest way of building-up a stable business for the various products from the carbonization of coal is to meet the requirements of consumers; and this advice is as important to small works as to large ones. Saying this reminds how remarkably, during the last two or three decades, recognition has grown of the community of interest in the gas industry. Demonstration of this rose to the highest peaks during the long coal stoppage last year. It is also recognized that indifferent service on the part of any undertaking, whatever its magnitude, militates against the interests

of others. Indifferent service, however, is not always an effect of a want of will, but of a want of knowledge. Mr. Prentice is cognizant of the trials and troubles encountered in small undertakings, where (say) two or three men are responsible for the whole of the operations. They showed wonderful grit during the difficulties of last year. But Mr. Prentice takes the opportunity of assuring the men in charge of such works that they need not fear to approach, should they require to do so, those who are in control of larger works, because they are ever willing to extend a helping hand to the utmost of their ability. It is their natural reticence which holds them back from obtaining the assistance which their more fortunately placed colleagues are willing to give; but, after Mr. Prentice's invitation, there will be less hesitation on their part. On all hands, we see to-day appreciation that it is to the general advantage that where the standard of service is not all that it might be, it is better that means should be found to raise it, by co-operation or in other well-known ways.

Regarding the question of meeting the requirements of customers, the price of gas is of great importance. Price depends upon many factors. Those with which the President deals are coal and the secondary products. In connection with coal, he has great hope that the day will come when what is bought as coal will be actually that commodity, and not something diluted with rock, stones, or dirt, which are not carbonizing materials, and which consequently influence adversely the economical operation of plant and the quality and quantity of the products, primary and secondary. In his opinion, if systematic tests were always made of each delivery, and all reasonable complaints forwarded immediately to the sellers of the coal, a great step would be taken towards the day when coal of greater and more regular purity would be supplied to gas-works. There is no question that, in regard to secondary products, we have arrived at a time when those who do not make it a practice of preparing for the markets their commodities in a form which will best meet the requirements of their customers will gradually experience even worse trading conditions than they have done in the past, while those who do cater for the needs of their customers will make good progress. In the view of the President, what every gas engineer and manager has to work for is the creation of a constant demand, leaving behind him the old days of erratic demand, which was influenced more or less by the circumstances of the times. Better by far is it to have constant removal of coke from the works than to see mountains of it cumbering the yard, only to vanish when extremely cold weather comes along, or an emergency causes a scarcity of fuel. A regular supply to regular customers in Mr. Prentice's opinion is the most remunerative business. While it is not practicable to alter domestic grates, it is, as he says, possible to alter the character of the fuel, and so make it more suitable for domestic use. Any effort expended in providing clean, even-sized, and dry coke rapidly brings its own reward. In the same strain he writes in regard to tar, in which connection he remarks: "Every necessary quality—viscosity, durability, and elasticity—can "be produced at will, and, if we would reap the harvest, "all possible care should be exercised to see that every "gallon of tar sent out from our works meets every requirement of the road engineer." He says that little help in the future can be derived from sulphate of ammonia. Owing to the synthetic product, its manufacture by gas-works is fast becoming a problem; and it seems likely in the near future that this once profitable source of revenue will degenerate into merely a means of disposing of gas liquor.

The address throughout expresses the views of a practical mind, and of an engineer who is guided in his doings by a high sense of the responsibilities of his executive and advisory position.

Dry Gas—A Point Concerning Gasholders.

To the subject of the dehydration of gas, increased attention has recently been directed through our "Correspondence" columns and in other ways, especially by the contribution of Dr. Davidson on April 20 (p. 174). That article should be studied in conjunction with one by Mr. J. Parker, which appears in this week's "JOURNAL." The two contributions supply, for those gas engineers and chemists who have not so far entered into an examination of the topic, a good starting-point for the consideration of the question of the drying of gas in combination with naphthalene removal. We need not, to-day, discuss the advantages of eliminating naphthalene, but merely say regarding it that Mr. Parker gives reasons why the drying process should precede that for naphthalene removal. Confining attention to the drying of gas, it has long been known how water vapour, in the presence of oxygen, cyanogen, carbon dioxide, &c., produces corrosion inside gas mains, service-pipes, and meters. The effect of corrosion upon the expenditure of a gas undertaking cannot be measured with any exactitude; but it is recognized that it must be substantial. It is, therefore, safe to say that the saving resulting from the process of drying gas overwhelms any cost incurred in carrying it out, even if the water vapour is only partially reduced, providing there is adjustment of the testing regulations for calorific value in the manner suggested by Mr. Thomas Hardie (*ante*, p. 174). Mr. Parker tells us in his article that it has been proved by experiment that, if the water vapour is reduced to the extent that it will not condense out of the gas at the lowest seasonal temperature to which it will be exposed, it has no effect on iron and steel. The process of which he particularly treats is that known as the "Dri-Gas" one, in which the means of dehydration is to bring the gas into intimate contact with a strong solution of calcium chloride. Though not the most powerful agent which could be employed, it has advantages in its favour. On these matters Mr. Parker enlarges; and incidentally it is mentioned that the cost of the "Dri-Gas" process, including capital and all other charges, even on small works, is not more than $\frac{1}{8}$d. per 1000 c.ft. treated.

In the article preceding this, it is mentioned that, at the Ipswich meeting of the Eastern Counties Gas Managers' Association, the President (Mr. Frank Prentice) made reference to the tankless holder, and other points concerning it were dealt with in a discussion which he invited. In this connection, Mr. Parker's article is distinctly suggestive. In one place—having mentioned that treatment of the gas to reduce the water vapour will give a greater factor of safety in the use of waterless holders—he says: "Apart from the actual danger of freezing water trapped "in the seals of such holders, there is a definite disadvantage arising from the ordinary condensation within the "holder, even in comparatively warm weather. The condensed water, in cases observed, emulsifies with water "gas tar, resulting in a great increase in viscosity of the "tar, which is a disadvantage in several directions." In the discussion upon his address, Mr. Prentice stated that "he could not see the object of drying gas before passing it into a holder over a water-filled tank. If the holder had not this steamy vapour inside—and the waterless holder had not—then they could dry the gas at which point they preferred." Probably in view of Mr. Parker's suggestion, Mr. Prentice—having regard to the importance of maintaining the tar seal in a condition appropriate to all seasons of the year—will reconsider the point as to the drying of gas before or after admission to a waterless holder. Regarding water-tank holders, Mr. Parker, from his close study of this question of drying gas, makes this point: "It is found in practice that, "if the gas be treated before entering the holder, and "the water in the tank has a film of oil on it, the amount "of water taken up increases the dew point by only 2° "to 3° Fahr." This, he adds, allows a safe margin, except in very extreme cases, where the temperature of the services may be lower than 30° Fahr.; but, under these exceptional conditions, the amount of water condensed would be very small indeed. It will be useful to consider these submissions by Mr. Parker in connection with the discussion which took place at the Eastern Counties meeting.

Monthly Accounts.

THERE has been a little abatement of the outcry in the newspapers against the increase in the amount of gas accounts for the past quarter; the Trade Disputes Bill having had larger claims. Even from carefully fostered outbursts of this kind, something practical may emerge. From time to time suggestions have been made that there

should be more frequent meter readings, rendering of accounts, and the collection of money owing by gas consumers. Some undertakings, we believe, have discarded the quarterly account system, and now render the accounts monthly. In this there are advantages and disadvantages. The latter are at once apparent. The change means more frequent meter readings, and twelve accounts and collections instead of four. The increased work would necessitate an enlarged staff, stationery, and expense, owing to more work having to be done; but it is stated that actuarial investigation in one quarter suggests that the prompt payment would approximately compensate for the additional work involved. This seems too good to be true. In the newspaper controversy, the question of monthly collections has been thrust forward by several writers; and members of Parliament have been advocating the shorter period in the House, though it is a matter in which the Government cannot well intervene. However, it must be confessed that there is a good deal in the arguments that the more frequent rendering of accounts would enable consumers readily to keep in touch with fluctuations of their consumption; that the finding of the money for the payment of bills would with many be an easier matter than once a quarter (though, in the long run, it amounts to the same thing); and that it would keep the gas undertakings in closer touch with the consumers. Those submissions are correct for a large mass of ordinary domestic consumers; but it can well be conceived that not a few of the larger domestic, industrial, and trading consumers would rather not be worried with monthly accounts, and would prefer to adhere to quarterly settlements. Lady Hunter, writing in favour of the monthly account in the "Evening Standard" on Monday of last week, said there were a large number of women who had not foreseen that their gas bills would be so largely increased last quarter, and had failed to make adequate allowance for the contingency in the weekly or monthly household account. That we can well believe. Our evening contemporary asserts that at least one of the largest gas companies is known to be in favour of the change, if the demand for it comes from the consumers.

This reminds that some weeks before this furore broke out in the daily Press, Mr. A. M. Paddon, M.Inst.C.E., in his address to the shareholders of the Lea Bridge District Gas Company, dealt with the subject; and his arguments are well worth paraphrasing. Comparing the position of the prepayment consumer with that of the ordinary consumer, he said the former thoroughly understands the value of gas, and uses just what he requires. The fact that he pays for it before he consumes it makes him all the more careful in detecting and immediately putting a stop to any waste. With the ordinary quarterly consumer, this is not the case. He is using gas, so to speak, in the dark for a considerable portion of the time. He is only apprised of waste at the end of the quarter when the bill comes in. In Mr. Paddon's experience, generally speaking, there is not such good feeling between the ordinary consumer and the gas undertaking as there is between the prepayment consumer and the undertaking; and he attributes this to the fact that the prepayment consumer has control of his relations with the undertaking in a way that the ordinary consumer has not. In view of this, he considers that the popularity and stability of the gas business depend very largely upon the collection of money during short intervals, so as to allow consumers to acquire a true and accurate knowledge of their position before it is too late. In his opinion—and we agree with him, having regard to the fact that the consumption of gas to-day is largely dependent upon the vagaries of our climatic conditions, and will be more so in the future—gas undertakings will, to a greater extent, have to consider carefully, if they wish to go on increasing and further popularizing their business, whether the system of quarterly charge is not a mistake. Before the war it did not matter so much as it does to-day, because gas was then relatively cheap. But the price of gas (under the most favourable conditions) being what it is now, the quarterly account is not going to help sales. On the Continent gas business is conducted on the basis of short interval collections; and the system, while it may obscure from the consumer the importance of his gas account, does afford him, as Mr. Paddon says, facility for paying it, and the means of adjusting it to his personal needs as he goes along before he is committed to an extent which he may not be prepared to meet.

There is no doubt that this is a matter which is worth discussing in the interests of gas undertakings, in the light of present-day fluctuations of gas demand, which are brought about very largely by outside causes.

Legislators in the Clouds.

Gas consumers will have to be educated up to the fact that the reduction of coal use and the increase of gas use means, naturally, a reduction of payment to the coal merchants and an increase of that to gas companies. A study of much of the "Gas-bill" correspondence which has appeared in the papers shows that the point has been ignored—at any rate, that is a fair assumption from the facts as stated. But for the gas industry, the chief interest of the week in this connection has shifted from the newspapers to the House of Commons. Lieut.-Commander Kenworthy asked the President of the Board of Trade (Sir Philip Cunliffe-Lister) about monthly accounts, to which reference is made in the preceding article. Colonel Wedgwood apparently has some idea that Sir Philip would be acting within the realm of practical politics and action if he instituted an official check upon the consumption of gas as recorded by consumers' meters; and he asked him whether he would make inquiries as to the desirability of taking powers to do this. Mr. Campbell, on the other hand, hoped the President of the Board would consider the question of appointing a Committee to inquire into these matters.

It is not a particularly edifying thing to see responsible public men inferring, if not actually charging, a gas company with what is tantamount to a criminal offence—that they have been charging for gas in excess of the registration of the meters. If this were the case, the consumers could soon bring them to book. Sir Philip is well aware of this; but he neatly turned the point into the proper direction by stating that meters can be tested if consumers are not satisfied with their operation. It is all a question of correct registration; increased consumption would not be charged unless the additional quantity were registered. Those consumers, however, who are of opinion that, through the meter mechanism, they have been cheated will not take the sportsmanlike step of having their meters tested at one of the County Council testing-stations, and, if proved correct, paying the fee with good grace. Allegation is easy enough; the proof is not, in their opinion, something they should pay for if they find themselves in the wrong. That is the way of a large part of the world. Sir Philip also showed how carefully gas is tested for calorific power and pressure by the local authorities, so what more could he say than that he could not see a special inquiry would serve any useful purpose?

We do not find, however, that the President attempted to answer a remarkable question by Col. Applin, which it would be kind to attribute to a joke by, and not to the serious belief of, the gallant and honourable gentleman. The Colonel asked if the President was aware that "the pressure of gas going through the gas meter depends upon the purity of the gas in the heating apparatus, and when gas is mixed with air you require much less gas than without air? Is the hon. gentleman also aware that the gas companies have been passing through pure gas unmixed with air?" Of course, the President of the Board of Trade is not aware of anything of the kind. What he is possibly well aware of is that the question was hugely funny. We will not put it stronger than that; nor will we spoil the humour of it by explaining to Col. Applin why it is his question has no foundation from beginning to end, other than that provided by ignorance.

Trade Disputes Bill.

The debate on the second reading of the Trade Disputes Bill will be memorable for the unprecedented exhibition of bad manners, cowardly interruption, and vulgar epithet which were indulged in from the Labour-Socialist benches. If evidence were wanted that the Bill was essential, the behaviour from Monday's sitting to the division on Thursday night would alone supply it. If argument were needed

that, in the interests of the nation something has to be done, and that effectually, to curb the extreme Left Wing of the Labour-Socialists party and the Communists, it would be found in abundance in the proceedings of our legislative assembly last week. The best traditions of the House of Commons have been assailed and trampled under foot in a manner which has caused righteous indignation throughout the land. When the Labour-Socialists talk of their hopefulness of regaining power when next appeal is made to the country, so that they may repeal this measure, they must remember that their unmanly conduct (which has not certified competence for legislative work) will be remembered by the electorate. They have done more harm than good to their cause, now and henceforth. It all shows that they had no good case to argue. Even the moderates among the Labour-Socialist party, who have testified that a general strike is wrong, found themselves in a position in which they felt constrained to take part and action which are a direct contradiction of their own previous deliberate expressions of view. The farther investigation is made, one finds more and more what an enormous mass of opinion there is behind the Government in this particular matter, and from men and women of different political opinion. In every way the case for the Bill was well argued during the debate. As opened by the Attorney-General, it has four corner-stones—(1) The illegality of the general strike; (2) the illegality of intimidation and coercion; (3) no compulsion to subscribe to political funds; (4) undivided allegiance of civil servants to the State. In all four respects, both national and individual considerations furnish the necessary support for the installation of these matters beyond cavil. On Thursday night, the Bill obtained its second reading, on a vote of 386 for, and 171 against—a majority of no less than 215. The Committee stage on the Bill commences to-day. Immediately after the division had been taken on second reading, the Labour-Socialists produced a big mass of amendments for the rejection of parts of the Bill or alterations in its text. The Liberal party will also submit several. The Government, too, have tabled amendments to the principal clause. One of them brings lock-outs within the scope of the Bill; the other is designed expressly to make clear the position of the community. It declares that any strike is illegal if it has any object besides the furtherance of a trade dispute within the trade or industry in which the strikers are engaged, and is a strike designed or calculated to coerce the Government either directly, or by inflicting hardship upon the community; and it is further declared that it is illegal to apply any sums to the furtherance or support of any such illegal strike. The lock-out clause is in like terms.

Gas Supply to War Department Buildings.

After long negotiation, carried on through the British Commercial Gas Association, the suggested agreement with the War Office regarding the supply of gas to War Department buildings has reached a point somewhat more satisfactory to gas undertakings than was originally the case. Unfortunately, however, the proposed agreement is still not one which can be regarded as fair to gas suppliers; and it has, therefore, been resolved that, in the absence of more suitable conditions, individual undertakings should be left free to negotiate their own terms, having regard to local conditions, &c. At the same time, a Special Committee has been appointed to endeavour to arrange a conference with representatives of the War Office to place before them the facts regarding the use of gaseous fuel in barracks, &c. All undertakings making agreements with the War Office would do well to keep in close touch with the "B.C.G.A." regarding them. A report on the subject appears in later columns.

Tar Products Standardization Tests Committee.

In a later column, we announce the constitution of the Joint Committee which, as the result of the Tar Conference held in Manchester last November, has been appointed by the Institution of Gas Engineers, the Coke-Oven Managers' Association, and the Fuel Section of the Society of Chemical Industry, for the purpose of dealing with the question of the standardization of tar products tests. It is a strong Committee, and comprehensive in representation. The Chairman is Mr. W. J. U. Woolcock, C.B.E., of the Association of British Chemical Manufacturers. Dr. E. W. Smith has been appointed Honorary Secretary, and Mr. R. M. Drake, Assistant Honorary Secretary. The lines upon which the Committee have resolved to work are outlined in the notice published on another page.

The Companies Bill.

The Companies Bill, to which we made reference in our editorial columns for April 27, has, on the motion of the Lord Chancellor (Viscount Cave), received a second reading in the House of Lords. It is admitted that our company laws have, in the main, worked well and been honestly used. But there have been certain abuses; and the value of the measure from our point of view is that it contains clauses which are designed to protect the public against evasions of the law in connection with the sale of shares and the issue of prospectuses. It is agreed that the measure is of considerable importance and complexity. During references to it in the House of Lords, it was stated by Lord Hunsdon that a Committee composed largely of City solicitors competent in company law are considering the Bill. His Lordship expressed the hope that their report would be available to the House before the Bill was introduced for further consideration.

Coal Output.

During the week ended April 16, the output of coal fell to 4,683,100 tons; the number of workers employed being 1,028,300. In the previous week, the production was 5,294,400 tons; the number of workers being the same. The difference, of course, is due to the Easter Holidays. The following week (ended April 23), through the same cause, the output dropped to 3,640,000 tons, with the number of workers 1,025,200.

Coal Prices.

Throughout the coal industry, there are complaints that, despite all-round sacrifices and improvements, the colliery owners cannot find sufficient buyers for the output of coal, even at prices materially below the costs of production. This is leading to additional men being thrown out of employment, or working part time. In the case of one Northumberland pit, where the men have had notice to terminate their employment, the Managing-Director states that Britain cannot hope to compete with Poland so long as their men work for 3s. 2d. a day, and the railways carry coal 380 miles at a price which would have to be paid in this country for one-tenth of that distance. We do not want our miners paid anything like that wage. Regarding retail prices, it is announced that there will be more reductions by the first of next month, though some of the companies engaged in the distribution of coal will anticipate that date—in fact, in one or two instances reductions already obtain, averaging 3s. per ton less than those recently ruling. It is expected that during the summer coal for household purposes will be available at pre-strike prices.

Unemployment Movements.

Early last month, there was an ebb to the improvement shown during March in the unemployment returns; but this was swept away later on, and the balance got on the right side again. During the week ended April 11, the number of persons on the registers of the unemployment exchanges was 1,078,300. This was 4541 more than the previous week, but 53,911 more than in the corresponding week of last year. The week ended April 19 showed a continuance of this movement. The number of persons then on the registers was 1,106,400, or 28,148 more than in the preceding week, and 109,754 more than last year. It is noticed from an analysis of the returns that, in the week ended April 11, the increase in unemployment was brought about by women. In the week ended April 19, over 20,000 more men were out of work; while the addition to the number of workless women was approximately 4000. During the week ended April 25, there was a grand decline in unemployment. The total number of registrations was 1,044,800, which was 61,640 less than the previous week, although still 62,923 more than in the corresponding week of last year.

PERSONAL.

The Plymouth Gas Committee last Friday received the resignation of Mr. J. R. Bradshaw, Engineer of their Devonport gas undertaking, who has accepted the appointment of Engineer, Manager, and Secretary of the Hartlepool Gas and Water Company. Mr. Bradshaw was appointed to the Devonport Works only a year ago, and great regret was manifested by the Committee at his decision, while appreciation was expressed of the services he had rendered.

Mr. F. H. W. Harry, Assistant to Mr. J. W. Gibson, Engineer, Secretary, and Manager of the Launceston Gas Company, Ltd., has been appointed Manager and Secretary of the Northam, Appledore, and District Gas Company, Ltd.

Mr. William Phairn, Assistant Engineer and Manager at the Newton-on-Ayr Gas-Works, and formerly of the Troon Corporation Gas-Works, has been appointed Gas Manager at Newmilns. Before going to Troon, Mr. Phairn was employed at the Dalmarnock Gas-Works of the Glasgow Corporation. He takes up his duties at Newmilns on May 16. There were 47 applicants for the post.

Mr. S. A. Croker, Works Cashier to the Plymouth and Stonehouse Gas Light and Coke Company, who is retiring after 46 years' service, has been presented with a pair of binoculars and a smoker's cabinet by the Chief Engineer (Mr. P. S. Hoyte) on behalf of the staff. Mr. Hoyte mentioned that during Mr. Croker's association with that Company considerably over £1,000,000 in cash had passed through his hands. Messrs. G. H. Bolton (Secretary), R. J. H. Clark (Chief Assistant Engineer), J. A. Richmond (Distribution Superintendent), and J. W. Walters (Works Foreman) all spoke in praise of the recipient.

Mr. W. W. Atley, Engineer and Manager of the Stockton Gas-Works, has been elected a Member of the Institution of Civil Engineers.

Mr. Thomas Parsons Cooper, who has completed fifty years in the service of the York Gas Company, was, on May 5, the recipient of gifts—an inscribed clock from the Directors, and a silver rose bowl from his colleagues—marking his association with the Company. The presentation on behalf of the Directors was made by Mr. Alfred Procter (Chairman), who referred to Mr. Cooper's literary gifts and his research work, which had been and would be of great value to the citizens of York. Mr. Cooper, returning thanks, said he had passed through all the departments of the Company. Later, Mr. H. E. Bloor, the Secretary and Manager, on behalf of the staff, presented Mr. Cooper with a silver rose bowl.

An interesting "double event" in musical circles occurred recently in Dublin, when, it is gathered from the published results of the annual Father Matthew Feis, Miss C. Walsh was awarded the Gold Medal for viola solo, and Miss Nellie Walsh the trophy of the Feis, the "Father Matthew Cup," for contralto solo. These ladies are daughters of Mr. T. M. Walsh, Gas Manager at Navan.

ELECTRICITY SUPPLY MEMORANDA.

There are all-electric houses in Liverpool which are going begging. The Corporation Housing Committee have had no tenancy applications for upwards of 100 of the houses on the Walton Hall Estate. Unfortunately, the juvenile population in the district are not respecters of the property of other people; and it has been reported in the "Liverpool Echo" recently that, when the watchman's back is turned, the youngsters have found amusement in bombarding with stones the windows of the new property. This, of course, has got nothing to do with the fact that the houses are all-electric; but the all-electric equipment may have something to do with the fact that tenants are not rushing to secure possession of the houses. The "Liverpool Echo" points out that "apparently, despite the thousands of visitors to the electric house lately erected on St. George's Plateau, all-electric houses are not appealing to the tenants for whom they were intended in Liverpool." The "Liverpool Post" on Tuesday of last week appeared to be surprised that so many of these all-electric houses should have remained empty so long, seeing that it is averred other tenants have spoken highly of them. This contemporary states that for some time past there has been relaxation of the conditions for applications for tenancy. Any applicant on the Housing Committee's waiting list has been eligible for the tenancy of an all-electric house, without reference to the order of registration. But even so it appears that house hunters have been very shy of the "new fangled ideas." In view of this, the Housing Committee asked the City Council last Wednesday to abolish the preference to registered applicants so far as these houses are concerned. This means apparently that anybody able to pay the rent will be accepted as a tenant; and it is hoped that this wide spreading of the net will prove effective. We do not like the use of the term "net" in this connection.

To Let.

The Ladies Busy.

The ladies associated with electricity supply are increasing their activities. We compliment them upon their personal industry. They believe that, in the expansion of electricity service in the home, they have an important part to play. An ideal of the kind is good, always assuming that the apostles know as much about the actualities of electrical service as they know (say) about kitchen, nursery, and other requirements. The Electrical Association for Women have now branches in many parts of the country. Precisely what they are doing, we do not know; and we have not heard that their operations have led to any extraordinary increase in the domestic trading of the industry. What with the ladies, the district business promoting electrical circles, demonstration houses, and a six months' boosting campaign, the curve of domestic demand ought to be soaring up magnificently, especially with gas consumers rampant because, owing to the coal stoppage, they have had to pay increased rates for gas, and all their fuel expenditure has gone to the gas undertakings, instead of being divided between them and the coal merchants as is the normal order of things. Notwithstanding, the gas undertakings have only been showing an ordinary rate of increase on their whole output.

Amateur Work.

The latest branch of the Electrical Association for Women is on the North-East Coast, where one would have thought propaganda methods were incapable of being improved. The ladies obviously think otherwise. At the meeting at which the branch was formed, Mr. R. P. Sloan, the Chairman and Managing-Director of the Newcastle Electric Supply Company, and President of the Electrical Development Association, bestowed his blessing upon the new branch of the ladies' organization. We do not know whether he has been correctly reported, but one account of the proceedings informs us that Mr. Sloan said: "One of the great features that would arise from this Association was that women would not have to depend on others to keep things going, but would be able to mend their own burst pipes and fused electric irons, &c., for it was only lack of information that prevented them from performing such tasks now." Responsible electrical officers and the Technical Press are constantly protesting against novices interfering with electrical equipment when anything goes wrong. Warning has also been uttered at inquests when work which has had a fatal issue has been attributed to amateurs. We should not like to hear of any electrical lady receiving a shock—fatal or otherwise—through the encouragement given to them by Mr. Sloan, assuming he has been correctly reported. If he has not, a correction should be made in the statement attributed to him. We are not quite clear as to what he meant by the ladies mending "their own burst pipes." That, however, is a matter in which the plumbers' trade organization may be interested.

Village Lighting a Lady's Speciality.

Of course, some of the members of the Electrical Association for Women are distinctly clever. Miss Margaret Partridge, B.Sc., has won mathematical honours, and knows all about the principles of mechanics. For some time she worked in the office of a consulting engineer. She is the first woman to wire an entire village; in fact, she has been instrumental in lighting four—one in Suffolk, and three in Devonshire. She started this business by taking in hand the wiring of country houses. The smallest village dealt with is Cheriton Fitzpaine, with less than 300 inhabitants. The village runs the scheme as a co-operative society; each consumer has a share. Miss Partridge, we are told, has now converted herself into a Company—primarily for the purpose of rescuing villages from dependence upon oil-lamps and candles, and giving them electrical energy. Her retinue of men and women workers is increasing; and a sort of side issue is the training of girls in electrical work.

The "Ring" Obsession.

Talking of electrical work, it seems to us that the giving out of electrical contracts to firms abroad has caused a sort of epidemic of belief that the electricity industry outside the supply of energy is built-up of "rings," whose sole object in life is to "best" the customers. Some

time ago the registration of electrical wiring contractors was taken in hand for the sole purpose of ensuring that inferior material and bad workmanship, and all the injury involved to electricity supply, should be suppressed, and the contrary, at fair prices, should become the order of the day. Registration carried responsibility in all these directions; and now many electricity undertakings recommend, and will employ only, contractors who are registered—the registration being the hall mark of efficiency and an indication of the renunciation of shoddy work which can be carried out only at cut prices. "Rings" were alluded to at a recent meeting of the Preston Town Council, when there was a discussion as to whether the installation of electric wiring and fittings should be by direct labour or partly by direct labour and partly by the employment of contractors. Complaint was made by one councillor that, if anybody went to the Corporation electricity offices for counsel regarding electric wiring, he was referred to four or five firms on a panel, and obstructions were placed in the way of going to an outside contractor. The panel price is £1 a point; but the councillor in question stated that he has had work done at 12s. 6d. by a contractor who is not on the panel, and he asserts he has plenty of "bunce" out of that. This brought up the Chairman of the Electricity Committee (Mr. Councillor Hearney), who pointed to the fact that the panel is composed of contractors who undertake to maintain a specified standard of quality in their work. If there is any evidence of the panel resolving itself into a ring, he asked that the information should be passed on to the Electricity Committee, who would deal with it. However, the discussion shows that, whatever is done, with the best of intentions to protect the public, they will always look at cost, and despite all else—including the ignoring of danger through inferior quality—many of them will go to the cheaper man, panel or no panel.

Domestic Electrification in U.S.A.

We have heard much in this country regarding the wonderful achievements in America in domestic electrification. But the information has been somewhat discounted by a report which Mr. Thomas Roles, the Bradford Corporation Electrical Engineer, has made to his Committee. He has been visiting the United States in the capacity of a representative of the Incorporated Municipal Electrical Association. We have heard of the report before, and have had a little light as to its contents. But an editorial article in "Electrical Industries" amplifies the intelligence on the point of domestic electrification. The larger use of electricity *per capita* in America than here appears to be due to its application to railway, tramway, and industrial purposes, and not to domestic ones. Domestically, the chief use of electricity is for lighting, for which it is employed with a prodigality not met with in this country. Mr. Roles says: "Both from studying the apparatus seen in the supply companies' showrooms and from inquiries which I made, it appeared to me that developments in the use of electricity for cooking and heating purposes had not progressed in the States to the extent they have done in this country, except in so far as cooking and heating can be accomplished by apparatus which can be connected to an ordinary lampholder." Mr. Samuel Insull has stated that the sales with residential consumers average only about 360 KW.H. per annum. Even in the oft-quoted example of Chicago, the average is only 500 KW.H. per annum; while on the basis of last half-year's consumption by residential consumers in Bradford, the average annual sales work out at 704 KW.H. per consumer. There must be a care that there is not confusion between returns "per head of the population" and "per consumer." During the controversy over the Electricity Act of last session, the per-head-of-population basis was quoted; the Electricity Commissioners also use that basis; but Mr. Roles deals with the average per consumer. There is more merit in the latter than in the former. At the same time, a small number of consumers may have a large average consumption; a large number of consumers may make a more attenuated showing. But spread over the whole population, rich and poor, and adults and babies—the average figure may look anything but attractive. It was that appearance upon which the supporters of the Electricity Act, when in the Bill stage, so largely relied to press home the need of the Government measure. The basis of comparison has been unmercifully attacked; and those who used it have not been altogether comfortable over the criticism and revelations. They have shown the weakness of the case; they have also demonstrated the fact, by the comparison of the average consumption per consumer with the average consumption per head of the population, that there are a good many heads in the population who prefer to adhere to gas.

Wiring Price per Point.

There has recently been a great deal of controversy in the "Electrical Times" regarding the cost of wiring per point. We know from estimates which we have had before us that electrical contractors' prices vary considerably, just the same as do quality and workmanship. One correspondent in the "Electrical Times" has been quoting an average of 10s. per point; and this has raised indignation in many quarters, because it is impossible to believe that either the quality of material or the workmanship can be of a safe order at such a price per point. We are persuaded from work and costs which we have seen that "Megohm," in his "Wiring Notes" in our contemporary, is about right when he submits that the average price which a householder has to pay—and should pay if shoddy work is excluded—should be something between 25s. and 30s. per point for fair quality competitive work, and £2 to £3 a point on first-class jobs. These figures, he holds—taking small and medium sized houses selling (say) at £800 to £1500—will not be very far wrong if included is the whole of the wiring, main switches, fuses, distribution boards, plain accessories, pendants or plain fittings, lamps, and shades of sufficient size to extend below the lamps. He instances a recent contract wired in lead-covered cable with good accessories and first-class flex, the wiring for which was quoted for at about 25s. per point; but the cost of the whole job of about 100 points, including main switches and fuses, two or three simple special fittings, some well-glass fittings, decent shades on the other points, and a few watertight switches, but without lamps, worked out to about 32s. per point. For another job of 28 points, the wiring from the distribution boards to the lamp holders was between 25s. and 26s. per point, and the whole cost of the job was about 33s. 6d. per point. A year or two ago a schedule for a first-class tubing job of about 300 lighting points, with wiring from the distribution boards to the lamp holders (not including the lamps), worked out to about 29s. per point, while the whole job, including a certain number of radiator plugs, special fittings, two-way switch circuits, &c., and sufficiently heavy cables to provide for a reasonable extension of heating and small domestic power, worked out to about 50s. per point. Of course, these prices would to-day be considerably higher; but they represent the best class of material by London contractors, and were tendered for, in competition, to a close specification.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

May 19.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—Meeting at Abergavenny.

May 20.—BRITISH COMMERCIAL GAS ASSOCIATION.—Manchester District Conference at Buxton.

May 20.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Visit to the Nine Elms Works of the Gas Light and Coke Company.

May 21.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Visit to the Keighley Gas-Works.

May 21.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Annual meeting in Edinburgh. Presidential address of Mr. M. Darling, of Cowdenbeath.

May 25.—EVENING STAR LODGE.—Meeting.

May 25.—WESTERN JUNIOR GAS ASSOCIATION.—Visit to the works of Messrs. Willey & Co., Ltd.

May 26.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Spring meeting at Dudley.

May 26.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual general meeting and dinner, at the Hotel Cecil.

June 11.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Margate Works of the Isle of Thanet Gas Light and Coke Company.

July 12.—NATIONAL GAS COUNCIL.—Annual meeting.

Sept. 23.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Visit to the Torquay Works of the Torquay and Paignton Gas Company.

INSTITUTION OF GAS ENGINEERS.

May 20.—Gas Investigation Committee.

June 13.—Council meeting.

June 14-17.—Annual General Meeting in London.

Prof. Cobb's Report for the Sessions 1924-25 and 1925-26.—We have received the Report of the Livesey Professor (John W. Cobb, C.B.E., B.Sc. (London and Leeds), F.I.C.) on the working of the Department of Coal Gas and Fuel Industries (with Metallurgy) for the sessions 1924-25 and 1925-26. This will be published in next week's issue.

HIGH-PRESSURE GAS RESEARCH.

Among the many important developments in chemical technology in the present century may be placed the employment of high pressures on an industrial scale. The advantages of reduction in the size of plant and increase in the output resulting from working under high-pressure conditions have been such as more than to balance the increased capital cost of the plant and the difficulties of operation. And in regard to the latter, the economic production of alloy steels capable of withstanding

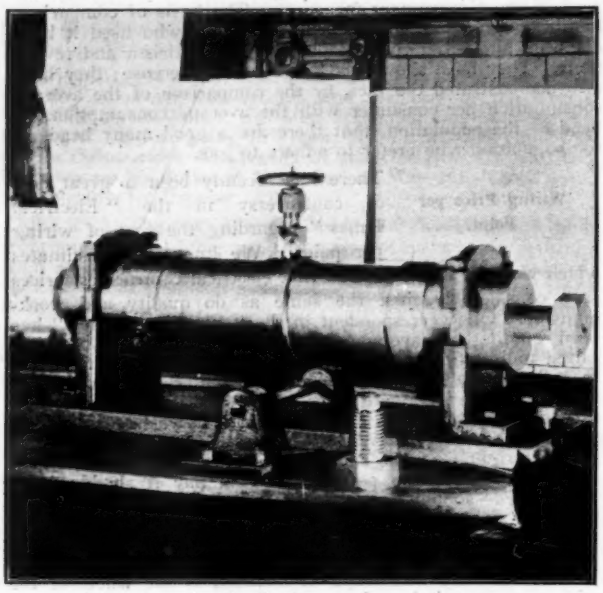


Fig. 1.—High-Pressure Bomb for Explosion Pressures of 1000 Atmospheres.

the severe demands made by a combination of high pressures and high temperatures has provided the solution to many of the earlier technical and engineering problems which at the outset rendered such processes both hazardous and costly.

Experience in running high-pressure plant has, however, shown the necessity for a much higher standard of training than is customary both for those responsible for the maintenance of the plant and for the operatives. The greater part of such training can, of course, only be obtained as the result of actual work on a high-pressure plant; but there still remain certain theoretical issues and fundamental principles that may best be investigated on a semi-scale in a suitably equipped laboratory. Moreover, the carrying-out of such investigations provides very valuable preliminary experience not only in the behaviour of gases and liquids at high pressures, but also in the various methods used for producing and measuring pressures, and in the properties of those materials available for the construction of high-pressure plant.

Prof. W. A. Bone, F.R.S., Head of the Department of Chemical Technology at the Imperial College of Science and Technology, whose name has more than once been associated with pioneer work in chemical technology, gave on Friday, May 6, the first of a series of eight lectures on High-Pressure Gas Research. This course of lectures, which we believe is the first of its kind to be given in this country, is designed to be of help to those contemplating high-pressure work, and is intended to make available the experience gained and the technique developed in the course of upwards of fifteen years' work, first undertaken at Leeds and after continued at South Kensington, on various aspects of gaseous reactions at high pressures.

The opening lecture was devoted to some general considerations regarding the organization of a high-pressure research laboratory and the precautions necessary in carrying out the work. In this connection, the lecturer laid stress on the importance of carrying out the work on a scale sufficiently large to indicate the nature of the problems likely to be met with on extending the operations to an industrial scale, without being of such a size as to involve unwieldy plant and the use of large quantities of material. The high-pressure laboratories at South Kensington include in their equipment plant for the preparation, purification, and compression of most industrial gases. These gases are usually prepared in quantities of 10 c.ft. at a time, and, after purification, are compressed into cylinders to a pressure of 150-200 atmospheres. In this connection the importance of control, by analysis, of the purity of the gases both before and after compression was emphasized.

There are at present in operation in these laboratories a high-pressure extractor working on the Soxhlet principle for the extraction of coals, and four complete units for the study of gaseous explosions, including separate filling systems, explosion bombs capable of withstanding explosion pressures up to 2000 atmospheres, and suitable manometers for recording the changes of pressure during the progress of explosions. There has also recently been installed in the laboratories a high-pressure unit for the study of catalytic reactions at high temperatures and pressures up to 400 atmospheres, in a circulating system. As an adjunct to the high-pressure laboratories is a well-equipped workshop, in which repairs and alterations to plant may be carried out, and in which all but the heavier items of plant may be constructed under direct supervision.

Having described briefly the plant and equipment of the laboratories, Prof. Bone next dealt at some length with the precautions to be observed in carrying out instructional and research work at high pressures. Owing to the nature of the work, the risk of accidents cannot be entirely eliminated; but by strict adherence to certain safety regulations, the risk may be greatly minimized. In a laboratory in which a number of people are working, it is essential to take such measures as will localize the effect of an explosion or failure of any part of the plant and will provide adequate protection against heavy missiles. Another necessary precaution is the systematic and frequent inspection of cylinders and valves, and the careful examination of all parts of a high-pressure system before com-

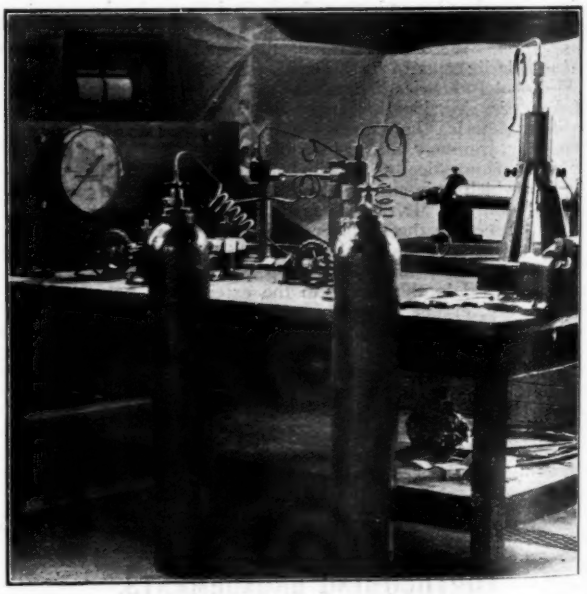


Fig. 2.—Circulating System for High-Pressure Catalytic Gas Reactions.

mencing any series of experiments. In conclusion, the lecturer described plans for an extension of the high-pressure laboratories and the installation of a unit for the study of gaseous explosions at initial pressures up to 1000 atmospheres.

The lecture was fully illustrated by lantern slides; and at its conclusion, the high-pressure laboratories were open to inspection. The second lecture of the course will be given on Friday, May 13, and will deal with the measurement of high pressures.

Southern Association of Gas Engineers and Managers.—On Friday, May 20, the Association will visit the Nine Elms Works of the Gas Light and Coke Company. Members will assemble at the Horseferry Road Showrooms of the Company at 10 o'clock, and will leave there for Nine Elms at 10.30. Following the inspection of the works, the Association will be entertained at luncheon, at Watson House, by the Governor and Directors of the Company. After luncheon an inspection will be made of the stores, training shops for gasfitters, and testing laboratories at Watson House, where tea will be provided at 4 o'clock.

Examinations of the City and Guilds of London Institute.—We have received from the Department of Technology of the City and Guilds of London Institute the papers set in this year's examinations in Gasfitting and in the Minor Course in Gas Supply Practice. These will be published in next week's "Journal."

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

The Jubilee celebrations and the Presidential Address of Mr. Herbert Lees, of Hexham, are reviewed in an Editorial article.

The Annual Meeting and Jubilee Celebration of the North of England Gas Managers' Association was held on Thursday, in the Lecture Theatre of the Institute of Mining and Mechanical Engineers, Newcastle. Mr. HERBERT LEES, of Hexham, presided over a large attendance.

The PRESIDENT, before the commencement of the ordinary business of the meeting, moved a resolution expressing regret at the deaths of Mr. George Young, Mr. Arnold Branson, and Dr. G. Weyman, appreciation of their services to the Association and to the gas industry, and deep sympathy with the bereaved families. These deaths, said the President, had taken place since their last meeting. Mr. George Young had been associated with the Association for forty years, though many members would know him by name only. He had made considerable contributions to the gas industry. Mr. Arnold Branson was trained at West Hartlepool, and did exceedingly good work. When he returned to Hartlepool as Engineer and General Manager, he was President of the Wales and Monmouthshire District Association. Mr. Branson had been a member of the North of England Association for 12 years, had passed through the Presidential Chair, and had rendered great service not only as an official of the organization, but on the National Gas Council and the Federation of Gas Employers. Dr. Weyman became a member of the Association in 1920, and though he was a young man, his work for the Association was perhaps greater than men much older. He contributed papers and took much interest in the Auxiliary Section. His writings to the Press and technical journals, and the book he had published, constituted a record of what he had done; and this work would not be forgotten. He achieved more in his shortened life than many could have done in a longer span. His persistency was remarkable; and he had left the industry better for his labours.

The PRESIDENT mentioned that among the principal guests of the Association on that occasion were Mr. John Wilkinson, the President of the Institution of Gas Engineers; Mr. Doig Gibb; Mr. T. Hardie; and two of their original members—Mr. James Whyte, of Seaham Harbour, who in a few more days would be 90 years of age, and Mr. M. Richley, of Shotley Bridge, whom the President had known for more than thirty years.

Mr. WILKINSON briefly thanked the members for the cordial reception given him.

Mr. NORMAN COX, Secretary and Treasurer, presented the financial statement, which showed a balance in hand of £25 16s. 4d., against a credit balance of £9 for the preceding year.

It was decided to contribute £10 10s. to the Benevolent Fund of the Institution of Gas Engineers.

NEW MEMBERS.

Elections of new members were made as follows: Transfer to full membership: Mr. J. B. Henderson (Wallsend District, Newcastle Gas Company). New members: Messrs. Robert Harle (Gas-Works, Silloth), John T. Houghton (Gas Office, Brampton), Arthur S. Brush (Gas-Works, Amble), and William Gledhill (Driffield). Associate member: Mr. W. Diamond, Marley Hill Chemical Company.

PRESIDENTIAL ADDRESS

OF

HERBERT LEES, Assoc.M.Inst.C.E., J.P., of Hexham.

When we met at Hexham last October we had passed through a period of five months during which none of the normal supplies of coal was available; and that experience was continued for a further two months. The history of those months as it affected the gas industry may never be written, but it is impressed upon the memory of those who were responsible for maintaining a supply of gas to the public more deeply than any written record could engrave it. We have the great satisfaction that once again the industry proved an important factor in helping the nation to win through a serious crisis; and though we had this experience so recently, we can repeat the words used by Mr. Henry Tobey in the opening sentence of his address to the members of this Association forty years ago—namely:

> It is a matter for congratulation to gas managers, engineers, and others interested in gas manufacture that, notwithstanding the prevailing depression of trade, and the cry of bad times, the gas industry has not materially suffered.

To-day we celebrate our fiftieth anniversary, and we think first of the men who pioneered this movement and of the times in which they lived. Not many of us are old enough to have any personal knowledge of the industry of those days, but three of the original members are still with us, though not now actively engaged in the work. I refer to Mr. Henry Tobey, of Malton, Mr. James Whyte, formerly of Seaham Harbour, and Mr. M. Richley, of Shotley Bridge. Our thoughts towards these veterans, who have served with great fidelity more than one generation in this industry, are very tender. We are grateful for the work they have done in helping to lay the foundations and to build-up this organization; and we trust that in their retirement they are enjoying that peace and comfort which they have so well earned. Mr. John Booth, formerly of Middlesbrough and later of Southport, was also one of the founders, and became the first Auditor. He is keenly interested in to-day's proceedings.

There is yet another who joined the Association very early, and served as President in 1883-84, who still retains a keen interest in the affairs of the gas industry. He is the earliest of the surviving Past-Presidents of this Association. I refer to Mr. Henry Woodall, who at the time referred to was Engineer of the Leeds Corporation Gas Undertaking.

It would be impossible to make fitting reference to all those who served the Association in its early years; but it is appropriate to record the names of those who were elected to office at the first meeting, which are as follows:

President.—W. J. Warner, South Shields.
Vice-President.—J. Hepworth, Carlisle.
Hon. Treasurer and Secretary.—Wm Hardie, Newcastle-upon-Tyne.
Committee.—Wm. Ford, Stockton-on-Tees; T. Trewhitt, West Hartlepool; C. Sellers, York; J. H. Cox, Sunderland.

My own membership dates back far enough to have known most of these men intimately in the work of the Association;

THE JUBILEE PRESIDENT.
Mr. Herbert Lees, Assoc.M.Inst.C.E., J.P.

and I am able to say that their interest and loyalty have not been surpassed. Some of these names are very familiar to us. Mr. Warner has left his mark on many phases of the industry. He brought out many inventions, including a machine for charging and discharging retorts. The patent with which his name is best known is that of the Warner and Cowan drum for wet meters. He was one of those who advocated the formation of the British Association of Gas Managers, of which he became President in 1879. In the list of Presidents, the name of Hardie appears more frequently than any other, and it covers the longest period in the Secretaryship. The name of Cox has been prominent in the work of the Association from its inception. It has had three representatives, one of whom would be known to very few of those present to-day. I refer to Mr. J. H. Cox, Junr., who gave promise of a career of great usefulness, which was cut short by an early death. A perusal of the transactions indicates what a valuable asset he had already become. The remembrance of the wise counsel and genial character of the father will not be forgotten by those who knew him, so long as his younger son is among us. If Joseph Hepworth may be said to have a successor in this Association, I do not think the claim to that distinction would be denied to me. I owe more than I can say to his example, advice, and help in many ways. It is a great privilege to have been associated with the men who formed this organization. To me it has been a most helpful experience, and has given me a better opportunity of estimating the value of their work to the industry than could otherwise have been the case.

VALUE OF THE ASSOCIATION.

The period in which the Association came into being is marked by the first of those scares which were supposed to sound the death-knell of the gas industry. It survived then, and has passed through other like experiences from time to

time, and to-day is more prosperous than at any period in its history. It was an opportune time in which to launch this enterprise; and the spirit of its founders is indicated in the following words quoted from the address of the first President—namely:

> The book of our professional life is now opened, with clear, unsullied pages, for your transactions to be recorded; let them be worthy of your profession and the great interests committed to your care, and they will be worthy of yourselves.

These are stimulating words; and the early transactions show that they were taken seriously. We have not always lived up to the example they left to us in that respect; but we may yet make good our deficiences. If the generation which is carrying the chief responsibilities to-day fails to do so, there is another one close upon its heels, which is alert. If the younger members will cultivate the habit of committing to paper their experiences and deductions therefrom, they may do more useful work than has yet been accomplished. The full value of such an organization is not to be measured by the number or length of papers submitted—though these constitute an essential part of the work—but also by the personal contact which such meetings give, and the opportunities they provide for comparing notes on many matters which concern us in the daily routine of our work. There is no need, nor is there any inclination, to keep back information which is likely to be useful to a fellow-member. The importance of this phase of our work was recognized when, nearly twenty years ago, the Special Purposes Section was formed. By means of monthly meetings, a vast amount of information on a variety of subjects is interchanged; and this has proved very valuable to the undertakings represented. The success of this department of our work created a demand for meetings at which the younger members, and others not eligible for membership of the Special Purposes Section, could have an opportunity to express themselves with like freedom; and the Auxiliary Meetings were established for that purpose, and have become an important section of the Association's activities.

Early Subjects.

It is interesting to note some of the subjects which engaged the attention of the members in the early years of the Association's history. A paper on "Waste in Gas-Works" was submitted at the second meeting, which was prefaced by a quotation from the "Journal of Gas Lighting" to the effect that "in gas-works everything was utilizable—not a particle of matter to be found in the works should be wasted." The author of the paper enlarged upon this in its application to every phase of gas-works practice, and stated among other things that the prevention of waste was "a test of management"—a dictum which is still true. On another occasion the need for more technical knowledge in the control of gas undertakings was emphasized, and suggestions were made which, though not practicable at that time, have since found expression in the examinations in Gas Engineering and Gas Supply having come under the control of the Institution of Gas Engineers; and in the greater work of scientific instruction and research which is at present carried out at Leeds University. It is evident, therefore, that our fathers in the industry were alive to the need for a closer connection between science and industry; and if we are worthy of our ancestry, we shall take full advantage of the facilities at our disposal, and shall have no difficulty in deciding what size of works should have chemical control. We shall prefer to be early rather than late in putting it into practice.

In this Association we have not drawn distinctions between the technical and the commercial and administrative sides of the gas industry. The rules have always provided for the admission of engineers and secretaries of gas undertakings on the same basis. This has undoubtedly been an advantage. This chair has frequently been occupied by members whose work has been purely of an administrative or commercial character, and the transactions have been enriched by the contribution of papers and presidential addresses on that phase of our work. We have occasionally gone outside the ranks of the permanent officials of gas undertakings, and have elected a chairman of a board of directors to the position of president; and the office has been held by men who were interested in bye-products works. The address of the late Dr. Sadler is one which may be read with advantage to-day as an example of how very interesting a highly technical subject can be made to read by one capable of giving a literary touch to his compositions. It has been a decided gain to have men in office who could look at matters from a different angle from that of the official within the industry. This advantage has not been confined to appointments to official positions, but also in securing the services of men who have specialized in certain subjects to address us thereon. Thus, Mr. J. Foreman, a photometrist well-known to many, gave us the benefit of a very extensive experience in a paper on "Some Extracts from a Photometrist's Notebook." If photometry is less talked about to-day, we do not forget that it was a subject of importance until within recent years. Dr. Bedson lectured on "Teclu's Method of Ascertaining the Heating and Illuminating Power of Coal Gas." Dr. Bone made one of his earliest pronouncements on "The Influence of Surface upon Gaseous Combustion," in a lecture to this Association. Prof. Cobb, in a paper bearing the title "A Problem of Modern Gas Practice," discoursed to us on recovering nitrogen from coal as ammonia, and dealt with some of the difficulties attending this. Mr. Jacques Abady has made very useful contributions to the transactions of the Association, and thereby to the industry, under the titles of "Light and Competition," and "The Commercial Position of the Gas Industry," each of which was opportune at the time it was made. The value of these contributions is ample justification—if such were needed—for leaving the beaten track of paper and discussion of our own experiences, important though they may be. Nevertheless, we depend mainly on the efforts of our own members for this work; and in the course of my researches into the transactions of past years I have been greatly impressed with the excellence and usefulness of many of the contributions contained therein. They have recalled some very successful meetings upon which one looks back with pleasant recollections.

Competition.

Reverting to the birth of the Association, we are reminded that it took definite form at an exhibition of gas appliances. This form of publicity was not so common then as it became later; and it suggests that the men of fifty years ago had the initiative and enterprise which are supposed to belong to a much later period, and to have been the result of competition. There is a certain amount of incentive to be derived from competition; it adds interest and gives zest to the work. Unless, however, it is accompanied by a keen desire to make progress, the advance will not be rapid. There are in every industry those who lack enterprise and to whom competition acts less as a spur than as a cause of complaint; and if the gas industry should have a percentage of such men in positions of responsibility, it would not be surprising. My own experience leads me to the conclusion that the percentage is small, and that men who have attained success in one direction are always on the look-out for further conquests. It is to such men that we owe the present position of the gas industry; and we need not suppose that wisdom and enterprise are the product of our own generation only. A great heritage has been left to us, and the responsibility devolves upon us to pass it on to our successors, adequately augmented in proportion to the superior advantages under which we work.

Growth of the Industry.

The growth of the industry can be measured by the statistics published by the Board of Trade as a Parliamentary Paper year by year, the first of which appeared for the year 1882. The latest returns are for 1925. Though it is impossible to give the development of the full fifty years, these dates are sufficiently near as an indication of what has been done; and some figures therefrom will not, I think, be regarded as out of place in this review.

I submit the following:

Table I.—*Statistics from Board of Trade Returns.*

—	1882.	1915.	—
Capital invested . .	£47,978,113	£139,113,456	190 p.ct. increase
Per million c.ft. sold .	£720	£523	27·36 p..ct. decrease
Gas made, thousand c.ft.	72,583,343	283,818,308	291 p.ct. increase
Gas sold, do. . . .	66,013,974	265,757,353	299 p.ct. increase
Main mileage . . .	17,508	43,178	140 p.ct increase
Gas sold per mile of main, c.ft. . . .	3,792,000	6,154,925	62·31 p.ct. increase
Number of consumers	1,971,971	8,200,455	316 p.ct. increase
Gas sold per consumer, c.ft.	37,917	32,407	14 53 p.ct. decrease

The foregoing figures relate to statutory undertakings only; and while they do not cover the whole of the industry, they are none the less valuable as showing the development which has taken place since 1882. In order to appreciate their value, it must be remembered that the gas industry had then been in active operation for seventy years, and during that period had built-up a very substantial business, as the first year's figures show. If we make a comparison of the increase in gas production which has taken place in recent years, we find from statistics given in the "Gas World" Year Book that during the past ten years the increase in the quantity of gas made amounts to 72,491 million c.ft., which is approximately equivalent to the total amount of gas made per annum in 1882—that is to say, the additional business which has accrued during the past ten years is equal to the total of the accumulated business of the first seventy years of the industry's history.

Several factors have had their bearing upon the results during the period under review. It has been remarked that electricity came into use for lighting about fifty years ago. It has had the favoured treatment as a public utility enterprise which is accorded to the "white-headed boy" of the family; and consequently nothing has been done to hinder, but everything to help, its progress. The introduction of the incandescent burner must have had considerable effect when it was first introduced in reducing the consumption of gas for lighting pur-

Third from the left in front row is the President (Mr. Herbert Lees). On his left-hand side is Mr. J. Whyte, of Seaham Harbour, who was about 40 years of age at the formation of the Association, and therefore now ninety. Another original member is to the right of the President (Mr. M. Richley, of Shotley Bridge). The President-Elect (Mr. T. P. Ridley, of Newcastle-upon-Tyne) is first on the left in the front row. Among others in the picture are the President of the Institution of Gas Engineers (Mr. John Wilkinson) and Mr. Norman S. Cox, the Secretary of the Association. Messrs. Doig Gibb, Hardie, Tarratt, Dru Drury, Walker, and other well-known men are there.

poses; but the demand for more light would, to some extent, counteract this. These are factors which would tend to retard the rate of increase in consumption; and having regard to them, the figures indicate more certainly that the industry is on a very sound basis.

On the financial side it is gratifying to note that the capital invested per million c.ft. of gas sold shows a very substantial reduction—and this notwithstanding the conversion and the consolidation of capital upon a lower dividend-yielding basis which has taken place in the intervening period. This advantage is more clearly indicated in the capital charges, which, however, are not given in the Board of Trade figures referred to above. But in a publication by the late Arthur Silverthorne, dated 1878, reference is made to "The London Gas Supply;" and statistics there given show that the capital charges of the gas companies supplying the Metropolis in 1877 (*i.e.*, the amount required to pay interest and dividend) averaged 15·19d. per 1000 c.ft. of gas sold. The corresponding figure for the year 1925, as given in "Field's Analysis," is 8·52d. This is a substantial reduction, and may be regarded as both a result of, and a help to, the development which has taken place.

Consumption per Capita.

The increases in the quantity of gas made and sold and in the number of consumers are, as might be expected, closely related to each other; the greater percentage increase being in the number of consumers. Consequently there is a reduction in consumption per consumer. This is explained by the very large proportion of additional consumers being on the prepayment system, and of the smaller type of houses where the requirements are obviously less than in larger houses and business premises, which formed the basis of the industry's customer's in the earlier years. The number of consumers (which may be taken at approximately 9 million, including non-statutory undertakings) at the present time does not appear to leave much room for an extension in that direction, apart from the increase in the housing accommodation which must, of necessity, take place; but the possibilities of increasing the consumption per house and for industrial purposes are still great. While not neglecting the opportunities afforded by additional building, we shall do well to cultivate assiduously the domestic and industrial needs of the community. In this connection it is interesting to recall that as early as 1882, when the subject of "Differential Prices" was being discussed at a meeting of this Association, the late Charles Sellers gave some figures relating to the York Gas Company, which show the trend of the sources of expansion even at that time. The increase in the day load, especially in the summer months, is one which has occupied the attention of the officials of gas undertakings since gas began to be used for purposes other than lighting. Mr. Sellers stated that, at York during the month of June, 1872, the day-load (6 a.m. to 6 p.m.) was 17·95 p.ct. of the 24 hours total consumption, and that in 1882 it had risen to 34·26. I am indebted to Mr. H. E. Bloor, the present Engineer and Secretary of the York Gas Company, for the most recent figures of that undertaking, which show that the day consumption has now risen to 66·6 p.ct. for the month of June, 1926. The corresponding figure for last year for the undertaking with which I am associated is 63 p.ct. It seems probable, therefore, that the general tendency is for the summer day-load to be much in excess of the night load. Pursuing this matter a step further, I referred to a paper presented to this Association in 1907, in which a table is given showing the consumption of gas for each month of the year in relation to December, which is the heaviest month with the undertaking referred to therein. I have taken the figures from that table, and added the corresponding figures for the year 1926. The comparison is set out in Table II.

TABLE II.—*Relative Monthly Consumption on the Basis of* 100 *for the Month of December.*

Month.	1891.	1906.	1926.
January	84·98	91·79	98·97
February	58·06	72·24	81·58
March	55·18	68·96	81·58
April	47·59	53·51	66·83
May	27·12	50·47	61·40
June	20·74	44·73	56·25
July	29·83	47·14	58·70
August	33·89	56·19	63·32
September	45·96	60·39	66·36
October	67·58	76·82	86·74
November	82·82	87·50	97·04
December	100·00	100·00	100·00
Average	54·48	67·48	76·56

This table shows clearly that the margin of difference between the summer and the winter load is becoming less, one result of which is that a greater proportion of the carbonizing plant is constantly employed, and that consequently the capital expenditure thereon per 1000 c.ft. of gas sold becomes less. These conditions will vary to some extent according to the character of the area of supply, but it will probably be found that the general experience is as indicated by the table. It can be claimed, therefore, that when the founders of this and like organizations set themselves the task of obtaining additional consumption to enable them to keep their carbonizing plant working more regularly, they were on right lines for bringing-down the capital charges and at the same time broadening the basis of consumption. There has been an extraordinary in-

crease in the number of gas fires in use in recent years; and as these are required more in winter than in summer, it might be expected that the difference between the winter and the summer load would tend to widen. This does not appear to have taken place, and it confirms the view held by some that it cannot be wrong to develop the consumption by every means and in every way that may seem possible. The gas exhibition method is less used than formerly, owing to the increasing number of showrooms which have been established throughout the country. This is a natural development of the industry's activities, and as a means of local publicity is unrivalled when it is well done. Those undertakings whose policy is advanced in this direction do not neglect other forms of advertising.

The "B.C.G.A."

The work of the British Commercial Gas Association is another phase of the industry's enterprise which has grown as the result of discussions at meetings under the auspices of such Associations as this. It may be said to have taken definite shape as the outcome of a paper submitted by Mr. F. W. Goodenough to the Institution of Gas Engineers in 1907—though it took some years to get going after that date. The District Associations lent their aid in the initial stages of its formation, and have from time to time acted as the agency through which operations have been carried on within the district areas. There are now many offshoots which make this less necessary.

The Society of British Gas Industries.

In a review of the work of the gas industry, it is fitting that some reference should be made to the work of the Society of British Gas Industries, which has now become an important organization for the furtherance of our common interests. The work of framing standard conditions of contract in conjunction with the Institution of Gas Engineers must have had the effect of helping to promote smooth working between contractors and those who employed them. The spirit of goodwill which has been generated by inter-association activities, and emulation among those who form its membership, have been valuable assets. The work of those sections which have done something to standardize their products has brought us nearer to those ideals which were enunciated by our predecessors at least a generation ago. They have shown their readiness to listen to and, if practicable, to adopt, suggestions made by men who, by investigation of engineering and chemical problems, were able to point in the direction where improvements might be effected. The work of research and experiment which is being carried out by members of that organization is proving of immense value by adding to the efficiency of manufacturing plant and of those articles of domestic and industrial use which are essential to the prosperity of the gas industry.

The National Gas Council.

A reference was made to the work of the National Gas Council in my address last October; but so valuable is that work (and that of the Federation of Gas Employers) that it is impossible to make too frequent reference to it, or to overestimate its worth. It is the organization which can speak for the whole industry, and which has done so on many occasions with marked effect. There is no excuse for any person connected with the gas industry being ignorant of its activities. These are reported month by month; and those reports are indicative of a vast amount of detail work which is being done with conspicuous ability in the interests of gas undertakings throughout the country. None is too small to receive attention when occasion demands; and the smallest has the benefit of the same help and advice as the largest.

Helping the Community.

When we compare the conditions and the meagre facilities for personal advancement and of organization for the industry which obtained fifty years ago with those which we have today, we may wonder that our predecessors made so much progress. We do not forget that great strides have been made educationally and industrially in other spheres, and that we have not done much more than keep pace therewith; but I think it may be said that we have kept abreast of the times, and that this has been achieved without help from sources outside the industry, and even against propaganda calculated to hinder. It is not enough that an industry should have a record of prosperity which can be tabulated in figures only. It will also be judged by what it has done for the community. This is a test to which the gas industry can respond satisfactorily in whatever form it is applied. Those who provide the capital for working it do so on very reasonable terms. The stability of the investment is such as to make this possible. If other industries were able to raise capital on like favourable terms, there would be no cause for the complaint, sometimes heard, that capital is getting more than its share of the product of industry. In saying this, let it not be regarded as an implied criticism of what is done in other industries which bear no comparison.

Co-Partnership.

The conditions of labour are among the best; the continuity of employment is a great advantage to the workman, the rate of pay and other benefits are such as to give general satisfaction. The progress of co-partnership and profit-sharing schemes has been steady and continuous, if somewhat slow, since one was adopted by the South Metropolitan Gas Company in 1889. The Labour Co-partnership Association, with its report for 1925, has published some particulars of 40 British gas companies' co-partnership and profit-sharing schemes, from which the following information has been extracted.

Total capital employed (share and loan)	£65,930,727
Number of employees working under agreement	37,172
Amount divided among employees for year ended December, 1925	£280,244
Total profits to employees since the first scheme was adopted	£2,635,242
Amount of shares and deposits held by employees at market value on Dec. 31, 1925	£1,944,819

These figures are really more impressive than they appear on the surface. The number of companies seems negligible

Founder Members of the Association.

A Unique Collection of Photographs.

(1) The late W. J. WARNER, South Shields.

Elected First President of the Association at Preliminary Meeting held on occasion of Gas Exhibition under auspices of his Company. The first person to suggest publicly the formation of the British Association, of which, for a long time, he was a strong and zealous supporter, as against District Associations. Engineer, South Shields Gas Company.

(2) The late JOSEPH HEPWORTH, Carlisle.

Member of Preliminary Committee. First Vice-President, becoming Second President in 1878. During his year of office the British Association of Gas Managers met at Newcastle, the headquarters of the North of England Gas Managers' Association. *Photograph sent by Mr. Lees.*

(3) The late WILLIAM FORD, Stockton-on-Tees.

Member of Preliminary and First Committees. Twice President of Association, 1879-80 and 1908-9. For 47 years Engineer and Manager of the Stockton Gas Company.

(4) The late JOHN HENRY COX, Sunderland.

Member of Preliminary and First Committees. Fourth President of Association, 1880-81. For 61 years Secretary and Manager of the Sunderland Gas Company. Died Sept. 19, 1909, in his 87th year.

(5) The late T. W. TREWHITT, Liverpool.

Member of Preliminary and First Committees. Fifth President, 1881-82. Secretary, Hartlepool Gas and Water Company.

(6) The late C. SELLERS, York.

Member of First Committee. President, 1882-83. Secretary and Manager of the York Gas Company.

(7) The late WILLIAM HARDIE, Newcastle-upon-Tyne.

Secretary of Preliminary Meeting, and first Hon. Secretary. Occupied this position from the inception to 1879, except for one year, 1885-86, when he occupied the Presidential Chair; his son, W. Hardie, Jnr., of Tynemouth, carrying out the Secretarial duties.

(8) HENRY TOBEY. Malton.

Joined Association at first General Meeting. Twice President, 1886-87 and 1911-12. Appointed Manager and Secretary of the Malton Gas Company in 1875, retiring in 1922. Member of North Riding Bench since 1912.

(9) JAMES WHYTE, Seaham Harbour.

Joined Association at Preliminary Meeting. President of Association, 1892-93. For 47 years Engineer and Manager of the Seaham Harbour Gas Company. Celebrates 90th birthday on May 21, 1927.

(10) The late W. SMITH, Darlington.

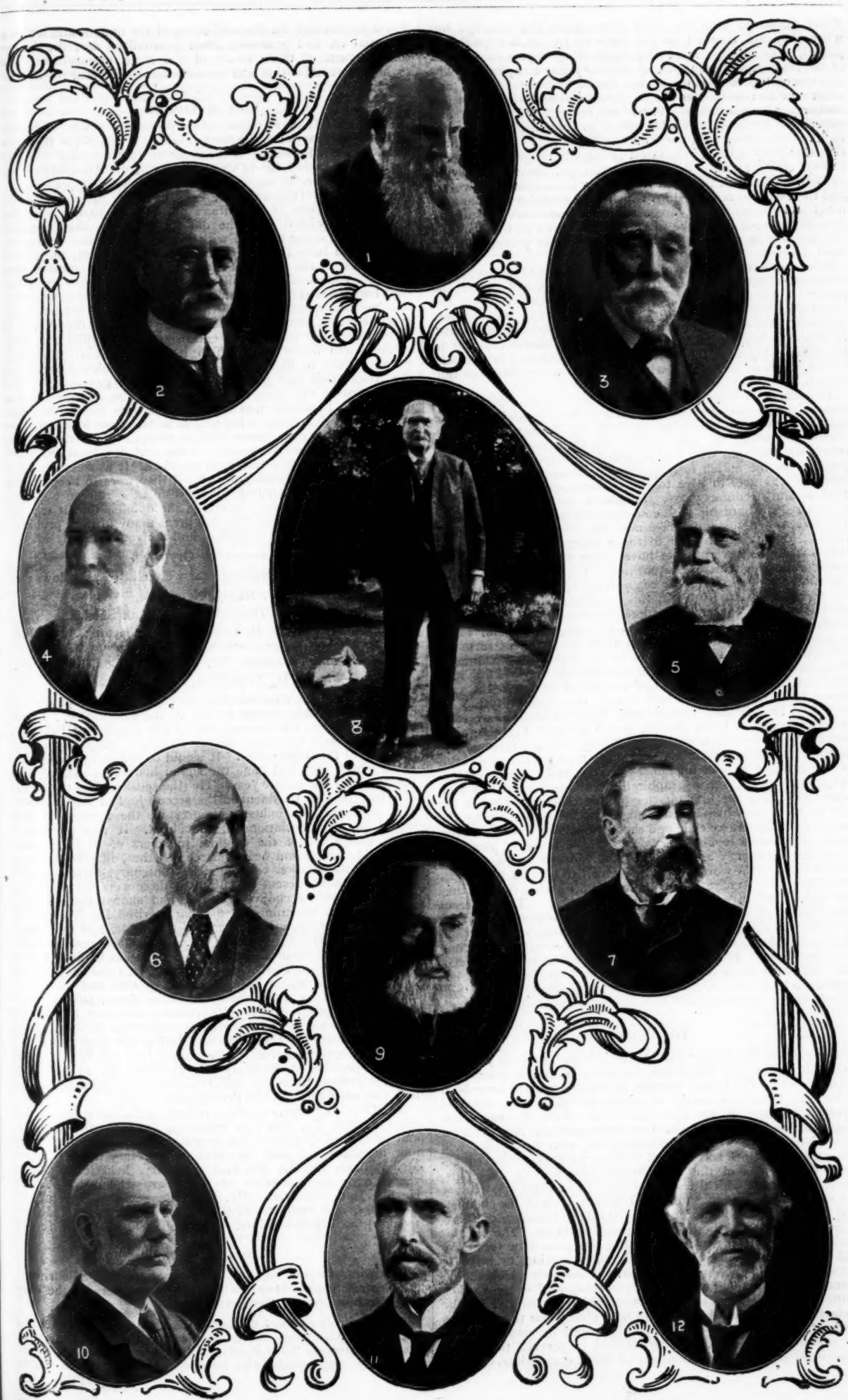
Member of Preliminary Committee, and better known as Gas Engineer at Bolton, to which place he went from Darlington. W. J. Smith, now at Bolton, is his son.

(11) JOHN BOOTH, Middlesbrough.

Member of Preliminary Committee, and first Auditor of the Association. Now living at Southport.

(12) MATTHEW RICHLEY, Shotley Bridge.

Joined Association at first General Meeting. Secretary of Shotley Bridge and Consett District Gas Company for over half-a-century, retiring in March, 1923.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when compared with the total throughout the country; but when they are counted on the basis of the total capital employed, they become more important—they represent 60 p.ct. of the total capital employed by statutory gas companies. The movement has long since passed the experimental stage, and must now be regarded as one of the established practices of gas company administration. There are enough information and experience available to enable others to form definite views as to its applicability to a particular undertaking. The Hexham Gas Company is one of the latest recruits to the movement, but cannot claim to have done more than put the machinery in motion. The spirit in which it has been inaugurated, however, and the excellent relationships which exist between the management and the workmen, are a sufficient guarantee of success. The advantages should be more easily secured in those undertakings which are not too large to maintain personal touch with the men.

Some undertakings have adopted pension and death-benefit schemes which are an excellent means of providing for the period of advanced years, or for the premature death of the bread-winner; and they must go far to remove that anxiety which is never entirely absent from the man with a proper sense of domestic responsibility. It will be seen, therefore, that in its relationship with the workers, the gas industry is not neglectful of those conditions which help to make their position secure.

The consumer is well protected by the operation of the sliding-scale of price and dividend; and when these provisions of the law have inflicted hardships—as they did during, and immediately following, the war—it was not the consumer that suffered, but the man who had provided the capital and made it possible for the nation to reap the great benefit which the gas industry was able to give to the common cause during those anxious and strenuous years. It must be said to his credit that he endured the hardship with commendable patience and loyalty. The losses then sustained have not been, nor will they ever be, repaid; and having regard to these things it cannot be said that successive governments have given to the industry that consideration to which it is entitled. True, the Gas Regulation Act made provision for readjusting the financial position for the future; but to obtain this, additional obligations were placed upon it. Something more remains to be done if the industry is to have a fair chance in the competition with which it is always faced; and when again the Government turns its attention to these matters, it is to be hoped that additional obligations and restrictions will not nullify the benefits it is intended to give. The financial protection given to the consumer is by no means the only benefit the community has received. The British Commercial Gas Association recently issued a pamphlet under the title of "The Sun's Fight Against Smoke," in which it is stated that during the last fifteen years London's annual sootfall has been more than halved as a result of the number of gas appliances having more than doubled. On its covers is given a graphic illustration of what has been achieved during the first quarter of this century. This is the sort of work in which we are engaged. We are helping the sun to fight the smoke evil; and though much progress has been made, the battle is not yet won. There remains plenty of scope for the energy and ability of the younger members; and they will find it a worthy cause in which to give of their best. There are others engaged in the same work, who, though they are allies, are in some respects competitors. The inherent possibilities of the gas industry, however, are such that its contribution should be greatest; and in making that contribution it can do more to conserve the nation's coal supply than its competitors. This is a factor which needs to be emphasized, and reiterated from time to time, as its importance does not appear to have been realized by those in authority, whose aim should be to encourage and help any effort made in that direction.

The Future.

The success which has attended the industry, and the progress made during the past fifty years, are great, but much remains to be done before the fullest benefits to the community have been attained. This is a work to which we may give renewed application; and if we face the future with the same enthusiasm and determination that characterized the work of those who founded this Association, the next fifty years will see other problems solved, and further progress achieved beyond the dreams of the most imaginative among us. This, then, is the task which lies before us. It provides opportunity for the genius of the inventor, the research work of the chemist, the technical skill of the engineer, the best qualities of salesmanship, and the highest administrative abilities. The organizations which have grown up within the past fifty years are valuable in co-ordinating the work and assisting to increase the equipment of those engaged in it. It is a task which should command the assent and active co-operation of every worker within our ranks, and of those who provide the capital for the industry. No undertaking should hold aloof from the activities and responsibilities of the national organizations, and no selfish or personal interests should be allowed to prevent the fullest co-operation for the advancement of this great industry which has done so much for the well-being of the nation, and which is essential to, and possesses great possibilities for, the further advancement of those ideals of "a clean atmosphere" and "the fullest utilization and conservation of our coal resources."

Vote of Thanks.

Mr. F. C. Tarratt (Newcastle), proposing a vote of thanks to the President for his address, said it was unique that they should have a President in the chair on that occasion who had an intimate knowledge of the founders of the Association; and it was a pleasure to know that some of these were present. At the meeting at Hexham, Mr. Lees gave the members a comprehensive review of the affairs of the coal strike; and they greatly appreciated what he did for them on that occasion. Now he had come forward with a second address. It was exceptional to have two addresses from a President, but it was the request of the members that Mr. Lees should address them on the occasion of the Jubilee of the Association. The President had referred to the founders of the Association as veterans; but he (the speaker) called them giants. The members appreciated that they were the leading men in the North of England. They had shown enthusiasm in forming the Association; and the way in which it had been carried on was fitting tribute to their work. The papers which members of the Association and prominent men in the gas industry had given formed excellent records of what the Association had done. The President was among those who had enthusiasm, and believed that competition was to be faced not in a complaining way. Junior members had advantages which their predecessors did not have, especially in the way of education, which had been brought to a very high standard. It was essential that they should take advantage of this if they were to keep abreast of the times. Regarding the President's reference to co-partnership, Mr. Tarratt expressed the opinion that it was one of the things which might solve a great many of their problems.

Mr. Dugald Currie seconded, and the vote was carried.

Election of Officers.

The officers for the ensuing year were elected as follows:

President—Mr. T. P. Ridley, Newcastle.

Vice-President—Mr. Dugald Currie, South Shields.

Committee—Messrs. B. Calvert, Northallerton; A. E. Ruffhead, Darlington; and S. A. Wikner, Newcastle.

Secretary and Treasurer—Mr. Norman S. Cox, Sunderland.

Auditor—Mr. C. H. Armstrong, Newcastle.

Mr. T. P. Ridley moved that the place and date of the next meeting of the Association be left to the Committee. Thanking the members for electing him to the position of President, Mr. Ridley said he would do his utmost to keep up the high tradition of the Association. It would be difficult to follow Mr. Lees, whom they had done the signal honour of making their President for the jubilee year. He (the speaker) had the honour of being the first President in the second half of the centenary. The more the gas industry progressed, the more need there would be for associations of that kind. It was pleasing to know that three of the original members of the Association were still living; and he wondered whether, fifty years hence, when the Association celebrated its centenary, there would be left any of those present that day. If there were, he hoped they would be able to claim that they had shown the same enthusiasm and determination as characterized the work of the founders of the organization and of those who had maintained it during the first fifty years. Mr. Ridley then presented Mr. Lees with a Presidential Certificate, which was instituted about fifteen years ago. That was the second Mr. Lees had received, and he knew it would be appreciated by him and his family, because it was for the jubilee year of the Association.

On the motion of Mr. Ruffhead, seconded by Mr. B. Calvert, a vote of thanks was accorded the retiring officers and Committee for their services during the past year. Mr. Ruffhead mentioned that it was unique that the President had held the position of Secretary and Treasurer for 19 years, and that the present Secretary and Treasurer, Mr. Norman S. Cox, had also been through the Presidential Chair.

Mr. Cox, in response, paid a tribute to the assistance he had received from Mr. Ward in preparing the souvenir handbook, and mentioned that since the formation of the Association only four members had held the office of Secretary and Treasurer. Mr. William Hardie, the first Secretary, held it for twenty years, with the exception of one year, when Mr. William Hardie, Jun., officiated. Mr. J. H. Penney was Secretary for five years, and then Mr. Herbert Lees for 19 years. He (the speaker), who followed Mr. Lees, had held the office for six years.

The Luncheon.

Following the meeting, the members and guests adjourned to the Central Station Hotel, where lunch was served; the chair being occupied by the President.

The President proposed the Loyal Toast.

Mr. John Wilkinson, O.B.E., President of the Institution of Gas Engineers, proposed "The North of England Gas Managers' Association." He mentioned that this was the first meeting of the Associa-

tion he had attended. Looking through the admirable souvenir handbook prepared for the day's proceedings, he was at a loss at first to understand why the all-important counties of Yorkshire, Durham, and Northumberland should seek to bring within their fold the somewhat humble counties of Cumberland and Westmorland, but he remembered the iron deposits of these counties, and then it was clear that these were really necessary to rock the cradle of the iron trades of the three important counties. He was sure the combination had resulted in benefit to all. The inclusion of Cumberland and Westmorland within the sphere of work of the Northern Association made a special appeal to him, because five years of his early life were spent on a small village gas-works in the latter county. If his memory served him right, he was taken to Carlisle during the same year that the Association was formed, to see for the first time a large gas-works. A perusal of the list of founder members also brought back many happy memories to those present. The names of Hepworth, Warner, Smith, Hardie, Ford, Sellers, Cox, and others recalled all that was best in the history of the gas industry; and there could be no surprise that the Association had achieved such wonderful success, and had passed through its ranks so many eminent engineers. The ability, energy, and sterling character embodied in the men who were responsible for the formation of the Association were bound to have considerable influence on those who followed after. Everyone present could recall those early lessons in geography when the importance of the Tyne and the Tees was stressed by the teachers; but he doubted if any one of them could form any conception of the colossal figures which would be required to indicate the amount of work, its extent and tonnage, which had been effected on the banks of those two rivers during the last fifty years. Coal, iron, steel, engineering (both motional and constructional), armaments, shipbuilding (for offensive and defence work, and for commerce), and a hundred-and-one other allied trades, which made the men of the North-East Coast feel that no other part of the United Kingdom had done so much as they to build up and weld together the British Empire, and, indeed, the world as a whole. There could be no doubt that the members of the Association had played their part in that mighty development of industry in the interests of humanity. Could anything be said more fitting to that day's proceedings than to express the hope that the success attained during the past fifty years might be maintained during the fifty years which would now intervene before the Association reached its centenary? He coupled with the toast the name of Mr. Herbert Lees, who, he said, was the oldest surviving Past-President, he having occupied the chair in 1895-96. For nineteen years Mr. Lees was Hon. Secretary and Treasurer, and he had the distinction of being the only Hon. Member of the Association.

The PRESIDENT responded. Referring to the remarks about Cumberland and Westmorland being included in the area of the Association, he said he did not know what was in the minds of the founders, but he did not see how they could leave them out. They had made considerable contributions to the records of the Association. Two Presidents came from Cumberland, and others who had occupied that position had been trained there. He mentioned Mr. Blundell as one of the former. Cumberland and Westmorland did not possess many large gas undertakings, but they had in charge of them men who were a credit to any county. One looked back with pleasure to having been associated with the men who formed that organization, and who for many years carried a great burden. His first contact with the Association was when he got out some information for a paper in 1882. Though he did not become a member until later, his interest commenced then; and it had not waned. Apart from the founders, they had been closely associated with many who afterwards became prominent. They had had Mr. Whyte, Mr. Tarratt, Col. Sadler, Mr. Penney (who had served the Association so faithfully as Secretary), Mr. M. Leafe (York), Mr. Wilkinson (Harrogate), Mr. Ford (Stockton), and Mr. Waddon. There were many names one recalled on that occasion, and they thought of them with feelings of affection for what they had done for them. They were men with whom they were also pleased to be associated in other walks of life. It had been a pleasure to him to render what services he could. He was connected with a number of other organizations, but none had shown more appreciation of the services he had been able to render than had the North of England Gas Managers' Association. It had brought him into closer touch with the Institution of Gas Engineers, the National Gas Council, and the Federation of Gas Employers. He commended the Association to the younger members, and informed them that anything they did would be appreciated. They need not be afraid to submit papers or to say what was in their minds.

Mr. CHARLES DRU DRURY proposed "Kindred Associations." He said that the British Isles were covered by eight Gas Associations, of which the Institution of Gas Engineers was the parent. All these Associations were doing good work. They were circulating useful information and statements concerning their activities, and bringing members into contact with each other. No other industry placed its experience and investigations and research more effectively at the disposal of them all in a free interchange of opinions than did the gas industry. This should not be overrated, for other associations, from their very nature, could not do so. The organization most resembling their own was the Coke Oven Managers' Association. There was the Society of Chemical Industry; and the opinions of chemists were of value to both gas undertakings and coke ovens. The good work done by the kindred associations was appreciated by them all.

The toast was heartily honoured.

Mr. THOMAS HARDIE, late of Newcastle, and now Chief Engineer of the Gas Light and Coke Company, and President of the Southern Association of Gas Engineers and Managers, in reply, spoke of the way in which the kindred associations had helped to maintain the high efficiency of the gas industry. The problems in the gas industry were not always the same. In the South, for example, they had problems different from those in the North. He spoke of the carbonization of coal and the importance of ancillary plant. They had to learn what almost every other industry was doing. There was a scare fifty years ago, when electricity, it was thought, was going to take a large proportion of the gas business. The gas people believed then that what they lost in light they would gain in power. While they had well maintained large supplies of gas for lighting and also for power, the development of the gas industry had gone on rapidly in other directions. It was the heating load which gave the industry its particular field to-day. He was delighted to have the opportunity of meeting old friends in the North once again.

Dr. JOHN T. DUNN, F.I.C., of Newcastle, also responded. He said this year was not only the jubilee of the North of England Gas Managers' Association, but also the jubilee of his association with the Chemical Society. In 1877 he became a member of the then existing Newcastle Chemical Society, which was formed in 1867 or 1868. It was absorbed later in the Society of Chemical Industry, which was now international. This Society dealt with chemical problems in general. These had become so much more complex that special sections had been formed; the most recent being the Fuel Section. He also commented upon the difference there was between the conditions which prevailed formerly, when people endeavoured to preserve what they considered trade secrets and those which prevailed to-day. It had been proved that they did much better by pooling their information. The example set by the gas industry had been followed by nearly all industries. From the point of view of the Society of Chemical Industry, he expressed the hope that the free interchange of opinions which they gave from one association to another would increase as time went on.

Mr. T. P. RIDLEY proposed "The Press." He said that the Press of the country was the cleanest in the world, and for this they should be thankful. The Press had an enormous power for good or evil, and he hoped they would appreciate the high reputation and the responsibility they carried. Occasionally they had a few newspapers which published things that were not justified by facts, but fortunately these were few and far between. It was not long since the Press did not seem to be friendly disposed to the gas industry. At that time they appeared to think there was only one agent for light and power—electricity. Perhaps the gas industry was at fault because they had not let the Press of the country know of what value the industry was. Since the industry put away its modesty, there had been no more to complain about so far as the Press was concerned. The Technical Press were to be congratulated for the dissemination of the transactions in the industry in all parts of the country; and they also helped in other ways. He referred to the work of the Secretary, Mr. Cox, in getting the various coats of arms correct on the souvenir, and added that the notes on these in the "GAS JOURNAL" would form a reference not only for the gas industry but for others. The Technical Press assisted them by the criticisms they were not afraid to make, and by the inspiration they gave in regard to policy.

Mr. Samuel Storey, proprietor of the "Newcastle Daily Journal and North Star," and Mr. Arthur F. Bezant, editor of the "GAS JOURNAL," replied.

Mr. STOREY, after congratulating the Association on the attainment of its jubilee, stated that last year during the coal strike, in the face of great difficulty, the gas industry not only gave the public the service they might expect, but showed great initiative, and turned themselves to the convincing of the public of the great benefits they could obtain from the extended use of gas.

Mr. BEZANT, on behalf of the Technical Press, expressed appreciation of the kind things Mr. Ridley had said respecting their services, and of the hearty endorsement of the members. Congratulating the Association upon its jubilee, he remarked that he could look back a great number of years over the history of the gas industry; and he was afraid that he began to think jubilees were things that were not good, because his days of training for the work of the industry commenced not many years after the foundation of their organization. As one who had spent the whole of his life since in keeping observation of events in the gas industry, not only in this country, but on the Continent, and in other parts of the world, he could bear testimony to the good things that had come from the North. He supplied instances of men who were members of the Association and who had been selected for the highest positions in the industry, and spoke of how the technical literature of the industry had been enriched by many contributions from the Association. He recalled his early associations with Mr. Joseph Hepworth, who once, while walking with him in the streets of Lincoln, said: "Bezant, in all the work you have to do in connection with the 'JOURNAL,' always look forward." That counsel he had endeavoured to carry out. ["Hear, hear."] Most of the remarks at the meeting and luncheon had been retrospective of the last fifty years. He urged that from that day those present and the rest of the gas industry should look forward. The Technical Press of an industry such as theirs had not only to keep its eyes open on gas affairs in this country, but to be very watchful of developments on the Continent, in America, and elsewhere. It dawned on him some time ago that it was highly essential that the gas industry of this country should keep very open eyes on what was going on in external industries and in other countries which might materially and fundamentally affect their interests in future. He would suggest to the President of the Institution of Gas Engineers that a Committee should be appointed expressly for the purpose of watching the developments that were going forward in other industries and abroad, so as to keep in close touch with them, and be prepared to act promptly and decisively should the necessity arise. That Committee should be composed not only of engineers, but of chemists and men of commerce, so that the whole of the aspects of any developments might be combined, and brought to a proper head. He gave instances of movements which singly or collectively might have influence upon the secondary products situation in the years ahead, but he desired that his remarks in this regard should not be reported. It was for the gas industry to investigate these things, and to determine the part it would take in them.

Several items by a musical party added to the pleasure of the luncheon proceedings.

NOTES ON NEW BOOKS.

PROGRESS OF APPLIED CHEMISTRY.

Annual Report of the Society of Chemical Industry.

Vol. XI., 1926, of the Annual Report of the Society of Chemical Industry on the Progress of Applied Chemistry has just been published, and in common with former Reports contains a wealth of valuable information on the work done in various sections of chemical industry during the year under review. In this issue, H. J. Hodsman contributes the Fuel Section; J. G. King and R. A. A. Taylor write on "Gas, Destructive Distillation, and Tar Products;" P. Parrish and F. C. Snelling are responsible for "Acids, Alkalis, Salts, &c.;" and A. T. Green deals with "Refractories, Ceramics, and Cements." In all there are 25 sections; but the four above-mentioned are those which interest the gas industry most. To attempt to review a volume of this nature would be absurd; but there are one or two points to which attention may be drawn.

Mr. Hodsman states that 1926 was notable for the establishment of new technical organizations, including the Institution of Fuel Technology. He suggests that there is nothing at the moment which will do more for the advancement of coal carbonization than the supply of clean coal. It is a matter for the mining industry, and cannot be overstressed in these days, when so much is being said of reorganization. It may prove the most important factor contributing to the popularization of a smokeless fuel supply on a national scale. He mentions that the application of the kinematograph to the experimental study of coal cleaning deserves notice. On the subject of low-temperature carbonization, the author states that, though ingenious and technically admirable processes exist, none is known to have established itself as generally applicable on a sure basis; and it does not follow that the systems which gain most publicity are necessarily the most successful. Mr. Hodsman calls attention to the recent work of C. B. Marson and J. W. Cobb, who showed that coke containing sodium carbonate could be gasified at 1000° C. at a much increased rate, yielding water gas almost free from carbon dioxide. These results, he remarks, suggest that a special technique may be developed for the generation of water gas for chemical manufacture. The gasification of coke offers a method of converting solid into liquid fuel, with a certain advantage over direct hydrogenation of coal; and it would be interesting if it were found that such synthetic processes could be carried out in small units, for there is much water gas plant in the gas industry standing idle in summer which might then be employed in the preparation of liquid fuel.

Messrs. King and Taylor mention Harald Nielsen's article which dealt with the centralized supply of gas (see "JOURNAL," Vol. 173, p. 341), and A. W. Sumner's paper on high-pressure supply from Grays, which he read before the Institution of Gas Engineers (see "JOURNAL," Vol. 175, p. 894). They call attention to the Fuel Research Board's interesting series of experiments on the production of gas of high calorific value in Glover-West retorts. The value aimed at was 560 B.Th.U. The actual gas yield was 66·7 therms of 568 B.Th.U., in comparison with 68·4 therms of 562·6 B.Th.U. obtained by the South Metropolitan Gas Company in inclined retorts. The authors share the view of Mr. Hodsman on the question of low-temperature carbonization. They record H. Winter's investigation on similar lines to the well-known research of H. Hollings and J. W. Cobb into the heat of carbonization of coal. Winter measured the thermal effects of slow heating on thin plates of coal, &c., and determined with one cannel and one coking coal that the reactions are endothermic to 250°, balanced thermally between 250° and 300°, exothermic to 450°, endothermic between 450° and 470°, and exothermic above 470°. These results are not in very good agreement with those of Hollings and Cobb.

In the section on acids, alkalis, salts, &c., Mr. Parrish has some very pleasant things to say about the Report of the Coal Commissioners. He regards it as no less important to the chemical industry than to those concerned in the mining of coal. "What is true of the coal industry is in some measure true of the chemical industry. Large units can alone endure foreign competition." The author mentions Sir Arthur Duckham's opinion that the judicious utilization of coke oven gas in a network of bus gas mains is no less essential than a network of bus electric mains. Mr. Parrish observes that the sulphuric acid industry is passing through a period of extreme perplexity. During 1926, sulphuric acid plants operated only to about 40 p.ct. of their capacity. This, of course, can be traced to the growth of the synthetic ammonia process, which has become dominant in the nitrogen field, with the result that the recovery of ammonia cannot be other than a charge against the manufacture of coal gas in the case of a large number of gas-works. Indeed, some undertakings are paying a not inappreciable sum to distillers for the removal of the liquor. On the question of the disposal of effluents, the author states that, "whatever one may think of the relative merits of vertical retorts as contrasted with horizontal ones, it is certain that the gas liquor resulting from the former is appreciably more toxic than that emanating from the latter. Again, when considering the economics of steaming in horizontal or vertical retorts, the pecuniary disadvantage of the increased yield of virgin gas liquor of low ammonia concentration should certainly be determined, and should appear on the debit side of any monetary statement."

ELECTRICITY UNDERTAKINGS DATA.*

The most up-to-date collection of data relating to electricity undertakings is enclosed within the well-known blue covers of the "'Electrician' Annual Tables of Electricity Undertakings" for 1927. Several new undertakings have been included; and there are particulars of projected schemes. For the first time, a comprehensive index is given, covering British undertakings, smaller British undertakings, and British power companies. Colonial and foreign undertakings also receive treatment. Regarding British undertakings, the information given includes system of supply, generating and transmission voltages, consumers' voltages, number of public lamps, maximum load, total connections, steam-raising plant, generating sets, output tariffs, &c. The local price of gas is also given, where possible at the charge per therm; but, in the majority of cases, the price is rendered at per 1000 c.ft. It would be a convenience to electrical engineers if in these cases the calorific power of the gas per cubic foot could also be given, so that they could ascertain the relative heat value supplied for a given price by the local gas undertaking in comparison with the calorific value of a KW.H. Glancing at the prices for gas, we observe that they are in several cases not the current ones, nor the average charged during last year, the conditions of which having naturally complicated the making of returns of normal charges. We would suggest, however, that it would be better in respect of gas prices to try to obtain some uniformity. Throughout London, the charge to-day is at per therm, and not at per 1000 c.ft. Nevertheless, we see that for Bethnal Green, Hammersmith, Hampstead, and Stepney the price is given at per 1000 c.ft. The section dealing with small British undertakings, schemes projected, &c., is interesting; and, in these times, the data supplied for electric power companies will be found both useful and instructive. It is noticed that in the section dealing with colonial electricity supply undertakings, many of them do not make the considerable difference between the flat rate charges for lighting on the one hand, and cooking and heating on the other, that the majority of electricity undertakings do in this country. This is the 40th edition of these "Annual Tables;" and the mass of information supplied shows an improvement with age in both quality and reliability.

*"The 'Electrician' Annual Tables of Electricity Undertakings for 1927." London: Ernest Benn, Ltd.; price 10s. net, postage 9d. extra.

Heat of Combustion of Gases.

In the study of equilibria between the chemical constituents of a flame, it is essential to have an accurate method of measuring the temperature of non-luminous flames. A method is being tested at the National Physical Laboratory for obtaining the temperature of the gaseous products of combustion. A refractory metal in the form of wire is heated electrically *in vacuo*, and the relation between temperature and heating current determined by an optical pyrometer. The same wire is then inserted in the flame, and the relation between temperature and heating current again determined. When the results are plotted graphically, the point of intersection of the two lines will give the temperature of the flame, for at the temperature represented by this point the electrical supply is sufficient to balance the radiation loss, whether the wire is *in vacuo* or in flame, so that the surrounding gas in the flame neither imparts nor extracts heat from the wire. A preliminary test was made at the Laboratory with platinum wire and a bunsen flame. The observations could not be carried beyond the point of intersection, owing to the melting of the platinum. It was found, however, that the point of intersection corresponds to a temperature of 1765° C. It is just possible to melt exceedingly fine platinum wire in the hottest region of a bunsen flame. The melting-point of platinum is approximately 1755° C., so that the agreement is very close. Moreover, one would expect a rather lower estimate of the flame temperature from the melting of the fine wire, as it would not be possible for such a wire to attain the full temperature of the flame, since the radiation from its surface would need to be supplied by conduction from the surrounding gas.

PURIFICATION OF TOWN GAS IN RELATION TO CORROSION.

By J. PARKER.

Speaking broadly, it may be stated that there are two grades of coal gas—namely, low grade and high grade, meaning gas of low and high calorific value respectively. But, in speaking of quality, a high-grade gas is not necessarily of high quality, nor is a low-grade gas necessarily of low quality.

Each grade of gas may be of either the one or the other quality, depending on the use to which it is to be put, and the degree to which purification has been effected. Thus, a 560 B.Th.U. gas, intended for domestic use, would be considered to be of poor quality if it contained, for instance, excessive quantities of sulphur compounds, or any other constituents liable to give rise to complaints from consumers.

It is not long since it was considered sufficient to free the gas from tar, ammonia, and sulphuretted hydrogen in order to supply a gas which would satisfy ordinary demands in regard to quality. When the Gas Regulation Act came into force, however, there was a general tendency throughout the country to make a gas of lower calorific value than formerly, and to change the methods of manufacture in order to produce such gas.

It is not necessary in this article to discuss the various methods of producing the lower calorific gas, nor to say whether they were right or wrong; but it is an undoubted fact that the number of complaints of so-called bad gas tended to increase with the change from higher to lower calorific value. Many of these complaints could, no doubt, be traced to improper regulation of the gas and air supply to burners, &c., and to unsuitable fittings; but there were other complaints caused by lack of pressure due to stopped services.

NAPHTHALENE REMOVAL.

One of the chief offenders in this direction was that objectionable constituent naphthalene, which was being produced in greater quantities than ever before.

It is within the writer's knowledge that, on some works with a make of 2 million c.ft. of gas per day, as much as £50 to £60 per month was being spent on clearing naphthalene stoppages from mains and services—to say nothing of the loss of goodwill. Naturally this sort of thing in a progressive industry could not go on without some attempt at a solution of the difficulty.

Previous to the year 1922 the number of undertakings systematically and completely removing naphthalene from coal gas by oil washing could be numbered on the hand. To-day most of the leading gas-works are practising the process, and upwards of one hundred plants have been installed, at both large and small works, with such marked success that, in many instances, the capital cost has been wiped out in three years or less by the saving effected in attending to complaints.

The references contained in the Presidential Address of Mr. T. Hardie to the Southern Association of Gas Engineers and Managers (see "JOURNAL" for April 6, 1927) indicate the degree of importance with which naphthalene washing is regarded.

CORROSION OF MAINS, SERVICES, &C.

The elimination of naphthalene as a cause of bad supply has made it possible to identify more clearly another source of trouble and expense. In past years undoubtedly much loss has been experienced from corrosion, and at the present time, due to modern conditions of gas making, this appears to be on the increase—a fact which is causing much concern. While it is generally accepted that corrosion of iron and steel, in nine cases out of ten, has to be associated with the presence of water, it is not generally recognized that corrosion inside gas mains, service pipes, and meters is chiefly caused by water vapour condensing to the *liquid* state, in the presence of oxygen, cyanogen, carbon dioxide, &c.

It can be stated with some confidence that, on the average distribution system, complaints due to corrosion and deposition of water now far outnumber the complaints caused by naphthalene.

One of the first experiments made in the investigations undertaken to provide a remedy for corrosion troubles showed that coal gas, from which even only a portion of its normal water vapour had been removed, had no effect at all on iron or steel exposed to it for periods varying up to four months. Even in the presence of those other impurities such as oxygen, hydrocyanic acid, and carbon dioxide, bright surfaces on samples of these metals have been maintained unimpaired.

Other samples exposed to a stream of the same gas in a saturated state gave a marked visible effect in less than twelve days, due to the formation of scale and rust. In practice it is known that coal gas, saturated with water vapour at ordinary temperatures, has caused so much corrosion in new services that they have become completely blocked in less than six months.

There are signs that water vapour condensed to the liquid state in mains is gradually coming to be recognized as the chief source of trouble to the distributing engineer, and that any process which would eliminate it, or reduce it to such an extent that it could not condense out at the lowest prevailing and seasonal temperatures of the mains and services, at a reasonable cost, is worthy of very serious consideration.

Actually a plant on a works with an output of one million c.ft. per day, for a period of ten months, has proved successful, and in accordance with the expected and calculated figures.

From a consideration of the statistics, it has been concluded that water vapour will not condense out of gas in services and mains at temperatures prevailing in this country if dried to 40 p.ct. humidity. That is to say, if the water content of the gas is reduced to two-fifths of what it would be if the gas was completely saturated at the temperature of entering the holders, no deposition of water vapour would normally occur at any time of the year.

TREATMENT ON A WORKS SCALE.

The dehydrating agent used in the "Dri-Gas" process can actually give, in ordinary circumstances, a humidity of about 35 p.ct. It has been established that this is by no means the limit for this particular agent with special handling; and still greater removals can be obtained by alternate liquids, which, however, have not been used on the large scale.

If under exceptional climatic conditions a reduction to 35 p.ct. humidity proves for a time insufficient, the amount of possible water deposition per degree at a temperature below 35° Fahr. is very small indeed compared with the possible water deposition between (say) 60° and 35° Fahr. Moreover, the velocity of reaction—that is, the rate of corrosion—is rapidly reduced as the temperature falls. These exceptional conditions of climate will, in any case in this country, be of very short duration; and the net effect of them, particularly in view of the above-mentioned considerations, is negligible. In practice they do not appear to have arisen.

The means of dehydrating used in this process on the large scale are to bring the gas into intimate washing contact with a strong solution of calcium chloride. This substance appears to have the balance of advantages in its favour, though it is not the most powerful agent which could have been chosen. It has been found, however, the most advantageous in practice, and the losses in operation over a period of nearly a year are scarcely measurable, either from chemical action with the gas or from any other cause. The washing liquid has no effect on the iron and steel parts of the plant.

The only other aspect of the process requiring notice is the fact that, as the water is absorbed, there is a heat effect corresponding to the latent heat of condensation. In fact, the process may be looked upon as an extension of the system of condensation, while at the same time it is also possible to consider it as a final purification of gas. Means have been provided for dissipating the heat evolved in the process, in order to secure the maximum dehydrating effect.

If the drying operation is carried out before the removal of naphthalene, the annoyance which is sometimes caused by water deposition in the naphthalene washer is entirely avoided. No emulsification or settling-out of water is experienced, and the oil remains perfectly clear and fluid, and a reduced consumption is thus made possible.

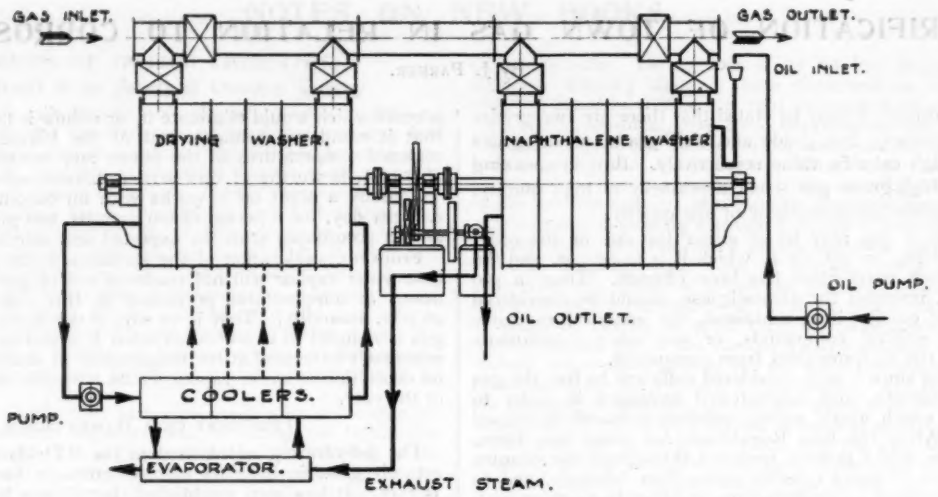
An interesting point in favour of treatment of the gas in the above manner is that it would give a greater factor of safety in the use of waterless gasholders. Apart from the actual danger of freezing of water trapped in the seals of such holders, there is a definite disadvantage arising from the ordinary condensation within the holder, even in comparatively warm weather. The condensed water, in cases observed, emulsifies with water gas tar, resulting in a great increase in viscosity of the tar, which is a disadvantage in several directions.

It should be noted that the countries at present employing this type of holder—namely, the United States and certain parts of the Continent—are exposed to more severe climatic conditions than we are in this country. This, however, is merely a question of the proportion of humidity it would be desirable to allow in treating the gas; and it is known that, by a simple extension of the present process, the dewpoint can be lowered indefinitely.

It has been suggested that in distributing dry gas, a great advantage would be found in that mains could be laid at any angle, and also that steel mains properly protected externally could be used with impunity in preference to the more expensive cast-iron type. Furthermore, as it would normally be expected that the syphons would remain dry throughout the district, the presence of water in any syphon might be regarded as an indication that the main was leaking, and the water coming in from the outside. These are points which will be interesting to distributing engineers.

THE "DRI-GAS" PROCESS.

This process, which forms the subject of a series of patents recently taken out by Messrs. Cooper and Henshaw, and placed on the market by Messrs. W. C. Holmes & Co., Ltd., has been developed with special regard to gas-works requirements. Pro-



COMBINED APPARATUS FOR NAPHTHALENE REMOVAL AND GAS DRYING.

posals which have been put forward based on previously-known methods—for example, employing high compression or refrigeration—are altogether too costly and too complicated in design and operation to merit general adoption.

In the "Dri-Gas process," plant and methods are employed which are already familiar to every gas-works staff; and the cost involved is nominal, having regard to the very large potential savings.

The diagram illustrates a combined plant for the removal of both water vapour and naphthalene. The gas is passed through the first half of a "brush" rotary washer in contra-current to a strong solution of commercial calcium chloride, which reduces the water vapour to such an extent that the dewpoint is lowered to about 25° Fahr. in winter time and 45° Fahr. in summer time.

The diluted solution, on leaving the washers, is circulated over tubes heated by exhaust steam from the engine which drives the washer, and so is reconcentrated. As previously mentioned, there is a temperature rise of a few degrees in the washer when the water vapour reacts with the calcium chloride; and for this reason the solution is continuously circulated backwards and forwards through cooling tubes to the washer.

The gas, on being dried, is then passed on to the second half of the brush washer, where the naphthalene is removed by gas oil.

The cost of the drying process, including capital and all other charges, even on a small works, is not more than one-fifth of a penny per 1000 c.ft. of gas treated.

It is found in practice that, if the gas be treated before entering the holder, and the water in the tank has a film of oil on it, the amount of water taken up increases the dewpoint by only 2° to 3° Fahr. This allows a safe margin, except in very extreme cases, where the temperature of services may be lower than 30° Fahr.; but under these exceptional conditions the amount of water condensed would be very small indeed.

Another method embodying the "Dri-Gas" process provides for the treatment of the gas at the outlet of the holders; means being employed to make the operation of the plant independent of the fluctuating load.

Formation of Iron Carbonyl.

It appears to be generally assumed that, given favourable conditions—*i.e.*, dry gas, and absence of oily condensates in mains and services—particularly with rise of temperature and pressure, iron carbonyl can be formed in the presence of CO in the distribution system.

In practice, however, the probability of its formation would be limited by the fact that oil spraying—admittedly good practice even in "wet" gas—would be much more effective in dry gas, because the oil would not be washed away to the syphons with condensed water. The risk of forming iron carbonyl in mains and services thoroughly coated with oil is, in the writer's opinion, negligible.

The experiments in the laboratory previously referred to, in which dried coal gas was passed over iron and steel for 136 days, without the protection which would be afforded by a film of oil, showed that the metals were not attacked in any way by any of the gas constituents. On the other hand, moist gas had a marked rusting effect in a very short time. This conclusion has also been borne out in practice on the works scale when distributing town gas containing large quantities of water gas.

It is probable that the formation of iron carbonyl under conditions of practice, and the effects either on iron and steel pipes or at the point of burning of the gas, are considerably less than has been suggested. Direct test on dry gas from the above process has so far given no positive indication of the presence of iron carbonyl.

STANDARDIZATION OF TAR PRODUCTS TESTS COMMITTEE.

As a result of the Tar Conference held in Manchester during November last year, the Joint Committee of the Institution of Gas Engineers, the Coke Oven Managers' Association, and the Fuel Section of the Society of Chemical Industry has appointed a Standardization of Tar Products Tests Committee consisting of the following gentlemen:

Mr. W. G. Adam, of the Gas Light and Coke Company.
Mr. S. Billbrough, of the Yorkshire Tar Distillers, Ltd.
Mr. G. B. Brook, of the British Aluminium Company, Ltd.
Dr. T. Howard Butler, of Wm. Butler & Co. (Bristol), Ltd.
Dr. A. F. Campbell, of Hardman & Holden, Ltd.
Mr. W. T. Collis, of the Midland Tar Distillers, Ltd.
Dr. H. G. Colman.
Mr. E. V. Evans, of the South Metropolitan Gas Company.
Mr. H. Fergusson, of Burt, Boulton, & Haywood, Ltd.
Mr. C. P. Finn, of the Coke Oven Managers' Association.
Mr. A. G. Francis, of the Government Laboratory.
Mr. G. A. Hebden, of the South Yorkshire Chemical Works, Ltd.
Mr. H. W. James, of the South Metropolitan Gas Company.
Mr. J. H. B. Jenkins, of the London and North Eastern Railway.
Mr. J. Macleod, of the Glasgow Corporation Chemical Works Department.
Mr. J. P. Miller, of John Miller & Co. (Aberdeen), Ltd.
Mr. H. E. Nickels.
Mr. T. F. E. Rhead, of the City of Birmingham Gas Department.
Dr. J. A. Roelofsen, of Dorman, Long, & Co., Ltd.
Mr. F. S. Sinnatt, of the Fuel Research Board.
Dr. P. E. Spielmann.
Mr. G. E. Thomas, of the Graigola Merthyr Company, Ltd.
Mr. W. J. U. Woolcock, C.B.E., of the Association of British Chemical Manufacturers.

Mr. Woolcock was asked to take, and he accepted, the Chairmanship of the Committee. Dr. E. W. Smith and Mr. R. M. Drake were appointed Hon. Secretary and Assistant Hon. Secretary respectively.

The above General Committee, at its first meeting on April 12, appointed panels to deal with the standardization of methods of testing tar and tar products as classified below:

A. Crude tar.
B. Pitch, refined tar, and creosote.
C. Benzole group of substances, and pyridine.
D. Carbolic compounds, naphthalene, anthracene, &c.,

and further panels to deal with:

X. Apparatus, constants, &c.
Y. Editorial (to obtain uniformity in terms and units throughout standard tests).

These panels will report back to the General Committee on the work they undertake, and throughout their investigations will work in close collaboration with the British Engineering Standards Association, the American Society for Testing Materials, the Institution of Petroleum Technologists, and other competent bodies.

All communications should be addressed to the Hon. Secretary at 166, Piccadilly, London, W. 1.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

HALF-YEARLY MEETING AT IPSWICH.

Much was seen and heard of the waterless holder at this most successful meeting. A two-million c.ft. example is under construction at the President's works; and he dealt with it in his address, which he opened for discussion. The address is referred to in an Editorial article this week.

The disastrous condition of the coal industry last year had as an inevitable consequence the limiting of the activities of the Association; and a meeting which it had been intended to hold at Ipswich—to the Gas Company of which town the President, Mr. Frank Prentice, is Engineer and Manager—had perforce to be by-passed. However, Mr. Prentice's period of office was extended to two years; and the invitation to visit Ipswich was cordially renewed, and as cordially accepted. It took place on Thursday and Friday of last week, and was largely attended; there having been keen anticipation of pleasure and profit which events amply justified.

A Two Million C.Ft. Waterless Holder.

Ipswich has various claims to notice; but at the present moment, so far as gas engineers are concerned, there is one which puts all others in the shade. The storage capacity of the works is being practically doubled by the addition of a tankless gasholder. During the past ten or a dozen years, a number of these holders—over a hundred, in fact—have been built in other parts of the world; and some of them of the very largest size; but the Ipswich Gas Company were apparently the first to start the erection of one in this country. It is a notable breakaway from precedent; and naturally it constituted the main topic of discussion during the meeting. The various points about this type of holder were emphasized by the President at the meeting; and subsequently at the works members were afforded ample opportunity of clearing-up matters about which they might still have felt doubtful in their own minds.

THE PRESIDENT,
Mr. Frank Prentice, of Ipswich.

When mentioning the matter to the shareholders a short time ago, Mr. Henry Woodall, M.Inst.C.E., J.P. (the Chairman of the Company), made it quite clear that he shared with Mr. Prentice the responsibility—if, he said, it was a responsibility—of adopting this type of holder. To begin with, he explained, the cost of the holder and foundations was some thousands of pounds less than that of a holder in a tank; and the position of the undertaking was such as to render a holder of this type eminently suitable, because such holders gave constant pressure—not fluctuating as did those of the ordinary type. This would save them the considerable cost of pumping now necessary. When informing the manufacturers that he was prepared to have one of these holders, Mr. Woodall stipulated that they should employ a British firm to do the work; and subsequently the Directors accepted the tender of Messrs. Edward Cockey & Sons, of Frome, and not that of a German firm. Most of the material comes from Germany; but what can be procured here is so being obtained. Some of the accessories are being made in Ipswich. What are Mr. Prentice's views on the subject of the waterless holder may be gathered from a perusal of his Presidential Address. Indeed, there is absolute confidence on the part of everyone connected with it in the entire success of the holder. No one on the works feels the slightest apprehension on the score either of safety or longevity.

When members had time to visit the Ipswich Gas-Works, they found the erection of the new holder at an interesting stage. The Company themselves undertook the foundation work, which was begun some seven months ago, and completed at the middle of last December. The plan of erection of these holders is peculiar. After the bottom has been placed on the foundation, the roof is the next work undertaken, thus providing a certain degree of protection for the workmen. The next step is the piston, to which the roof is temporarily connected, forming an erection platform, which is blown up tier by tier as the work proceeds, and provides a continuous check on the accuracy of erection. On this the revolving erecting crane is fixed. A good many rows of plates have already been riveted in position; and it is expected to work up to a speed of two tiers of plates a day, so that July should, as originally anticipated, witness the completion of erection. From the engineering standpoint, the feeling generally expressed was one of great admiration; the simplicity of the design and the ingenuity displayed by the inventor being freely commented upon.

LUNCHEON.

Thursday's proceedings opened at the Gas Offices in Carr Street, where a very large party of members and guests, including many distinguished townsmen, were entertained at luncheon by the Chairman and Directors of the Ipswich Gas Light Company. Mr. Henry Woodall presided; and by the cordiality of his welcome to the Association added to the enjoyment of the generous hospitality provided. His Worship the Mayor of Ipswich (Mr. C. E. Tempest, J.P.), too, was present, to tell the visitors how pleased the authorities were to see them. The President, of course, was indefatigable in looking after the comfort of the guests, as were also Mr. G. Ambrose Mallett, A.C.I.S. (the Secretary), and the other officials of the Company.... Among those present to whom special reference was made, were Mr. S. S. Ogilvie (Joint Manager of the National Gas Council), Mr. W. M. Mason (Manager of the "B.C.G.A."), and Herr Fink (one of the Directors of the "M.A.N.").

The Loyal Toast was duly honoured.

Pay the Bills.

The Mayor, proposing "The Eastern Counties Gas Managers' Association," extended a warm welcome to the members. They were glad to have conferences in the town. Early this year the local Chamber of Commerce held a conference which they called "Shopping Week." In this they had had the assistance of the Ipswich Gas Company. The Secretary of the Company, Mr. Mallett, was Chairman of the Chamber; and he brought about one of the most successful of such conferences that they had ever had. He wished to take this opportunity of congratulating Mr. Mallett upon the extremely good work he had put in. When he came to think of the Eastern Counties Association, he wondered where all the members present came from. But there they were, all working in the interests of a great proposition. The country last year passed through a very trying time; and had it not been for the gas undertakings, people would have suffered severely. He did not know whether the community was sufficiently grateful to those who had thus striven during a period of hardship. There must have been an enormous amount of difficulty in carrying on that work, which had been faced with the greatest courage and determination. Now came the matter of paying the bills. His advice to everybody was not to question the bill, but to pay it. By doing this, they would be paying the best tribute they could to the gas industry for all it had done. Ipswich was a progressive place; and gas, with other things, was going ahead. He knew that the Chairman, Mr. Woodall, was very proud of his Company.

An Association with an Area of from 6000 to 7000 Square Miles.

Mr. Frank Prentice remarked that, as President of the Association, it was his duty and privilege to respond to the toast so ably proposed by the Mayor, whose presence that day they esteemed an honour. The district of the Association was far-flung—bounded by Lincoln on the North and Tottenham on the south, and all east of this line, ending with the North Sea, making a total area of 6000 to 7000 square miles. Among its main objects were mutual helpfulness and the interchange of ideas and experience—all tending to the benefit of the consumers of gas in the respective towns. A marked illustration of the Association's value occurred during the disastrous miners' strike of last year, when those of the members who had good supplies were able to transfer coal rapidly by road, rail, or water to others whose stock was perilously low; and so they were able to maintain a supply of gas to the whole of their huge district throughout the seven months' strike. The Association consisted of men engaged in an enlightening occupation, who were sufferers from more misconceptions at the hands of the Press and the public than any other men living. They were supposed to be men who loved to pump air into the gas mains; or they were depicted as persons whose chief delight in life was to asphyxiate the public with poisonous gases. [Laughter.] As a matter of fact, exactly the reverse was the case. They were hard-working men, at their job all the way round the clock, ever striving to send out the cheapest, best, and purest gas they could manufacture. The purity of Ipswich gas was beyond ques-

tion. Quite recently a lady seeking rest and solace from the troubles of this weary world put her head in a gas oven, where she dreamed pleasant dreams for a couple of hours; and when some interfering persons pulled her out, she was found to be none the worse for her adventure. [Laughter.] Another misconception was that they were deadly enemies to electricity. This, again, was utterly incorrect. As a matter of fact, they all used electricity to a considerable extent in the production of their commodity. They were all capable of recognizing a good thing when they saw it, and always ready to avail themselves of it. Gas and electricity might well be likened to twin sisters. Both had their special values; and they should go hand in hand in the march of progress, for the benefit of mankind. Many of the members were equally at home in supplying electricity as they were in supplying gas. It might be news to some present when he told them that his friend Mr. Smith, of Tottenham, not only supplied over 3000 million c.ft. of gas per annum, but also served a large district with electric current. In effect, he said to the inhabitants of Tottenham: "You pay your money, and you take your choice." As a matter of fact, the gas-works was the right spot to generate electricity. Gas-works had the fuel, they had the power, they had the brains; and it seemed a great pity to him that that august and autocratic body known as the Electricity Commissioners should ruthlessly set their foot on progress in this direction.

Touching on the vexed question of road breaking, the President asked why should not all the parties concerned meet early in the New Year, have a bit of dinner to put them in a good temper, and then lay all their plans on the table, so as to see if it would not be possible by mutual co-operation to mitigate the nuisance caused by the different road users acting independently of one another. Reverting to the Association, he expressed their very grateful thanks to the Chairman and Directors of his Company for their hospitality. It was just 37 years since the meeting of the Association was held in Ipswich. Much water had flowed under the bridges since then; but progress had ever been the watchword of the Company, and never more so than to-day, when it had at its head, in the person of Mr. Henry Woodall, one of the most distinguished gas engineers in the country. On behalf of the Association, he thanked the Mayor for his remarks, and wished him every happiness and prosperity during his year of office.

The Ipswich Gas Light Company.

Mr. Thomas Glover, C.B.E., M.Inst.C.E. (Deputy Lord Mayor of Norwich), submitted the next toast—that of "The Ipswich Gas Light Company"—and expressed the pleasure of them all at meeting there that day with Mr. Henry Woodall in the chair, surrounded by his Directors and the officials of the Company. The Ipswich Gas Company they had always considered very fortunate in the constitution of their works and the succession of good Directors and Managers they had had. He believed the works were started just behind the present showrooms and offices in 1817; and through great foresight, they were moved five years later to the site they now occupied, and where the latest example of gas engineering was now being erected. In all these matters, the Company were to be congratulated. They had always looked upon Ipswich as a friendly centre for meetings; and although the Association had not officially met there for many years, there had been fairly frequent gatherings there of the Commercial Section, and so forth. The welcome had invariably been a warm one; and this was an occasion on which to thank the Chairman, Directors, and officials of the Company for all the kindnesses received. They were very fortunate in their President this year [Applause], and hoped they would soon find him occupying the chair of the parent Institution. He could not imagine anyone more suitable.

The Chairman's Appreciation.

Mr. Henry Woodall, after thanking Mr. Glover for the terms in which he had proposed the toast, and those present for the manner in which they had received it, said his colleagues on the Board and he were very pleased indeed to have the privilege of entertaining them that day. For one thing, the Directors knew the members of the Association were gentlemen of good taste and good judgment, because they had elected the Company's Engineer, Mr. Frank Prentice, to be their President. It would hardly be believed that Mr. Prentice had been connected with the Company for 46 years. During that time he had earned increasingly the respect and affectionate regard of the Board. To him (the speaker) it was a special pleasure to be presiding at that luncheon. He knew many of the members, and was fortunate in being Chairman of eight gas undertakings in the Eastern Counties, from the largest to the smallest—fortunate, because he had such able and pleasant people to work with.

Continuing, Mr. Woodall said: I am sorry that our meeting had to be postponed, as I should have liked to reply to my friend Mr. Glover as "My Lord Mayor." I am sure we are all proud of the fact that he was elected as the Chief Citizen of the ancient City of Norwich. In this Association you have many first-class engineers, and also first-class citizens; and I am very glad to think that good gas men take the position they do as good citizens also. I am sure our Ipswich friends here present will agree that our Directors and chief officials are keen on their town as well as their Company. We do realize that our prosperity is bound-up in the prosperity of Ipswich. I venture to include myself, because, although I have not the advantage of being a resident in Ipswich, I do in my humble way take a real and active interest in the town.

No Sympathy with Big Gas Bill Complaints.

There have (Mr. Woodall went on) been some complaints here, as elsewhere, as to the amount of gas accounts, though I am glad to state that in our case they are not serious. I prefer, however, to remember the thanks we received for the good work we did in supplying heat, power, and light when it was so badly needed during the coal strike. I must remind you that we, as a Company, suffered considerably; our shareholders and our co-partners suffered. I am glad to admit that we are a prosperous Company, and had something put by for bad times; and I need not tell you that last year our reserves had to be called upon to the extent of £10,000. I do not think that the people who write to the Press complaining of their large gas bills are deserving of sympathy. You will remember we warned our consumers that we should be hard-pressed, and begged them to be careful in the use of gas. It is those who were not careful, but who took in some cases an unfair advantage, who now complain most bitterly. The increase in the price of gas since the commencement of the strike in May last has rarely been as much as 25 p.ct.; and it is not an increase of that amount which is the cause of complaint, but rather the very much bigger percentage of gas used—in some cases well over 100 p.ct.—which is complained about. It is surely right that those who have used gas in time of stress should pay for it. I will not detain you longer, but will conclude by saying that I am very happy to see you. I enjoy the privilege of working with you; and I wish you a very pleasant and useful time in Ipswich. [Applause.]

THE BUSINESS MEETING.

The business meeting was held immediately after lunch, in the Council Chamber at the Town Hall—the President in the chair.

The President remarked that he was very pleased to see so large a gathering, and to join in the welcome to the town which the members had already received at other and more important hands. This was the first general meeting since the one held at Stamford in September, 1925. It was unnecessary for him to remind them that the unfortunate strike of last year had restricted the Association's activities.

Confirmation of Minutes.

The President said the first item on the agenda was the confirmation of the minutes of the last meeting. These had been published in the Technical Press, and in accordance with custom would be taken as read. He moved their confirmation.

Mr. P. D. Walmsley (Great Yarmouth) seconded the proposition, which was agreed to.

Letters of Regret.

The President said a letter had been received by him from the President of the Institution of Gas Engineers (Mr. John Wilkinson, of Nottingham), who was a valued member of their Association, expressing his great regret at being unable to be with them. The jubilee meeting of the North of England Association was being held the same day; and Mr. Wilkinson had felt his call was there rather than to Ipswich. They also particularly regretted the absence of the President-Elect of their Association, Mr. J. B. Hansford, of Bedford, who wired that he was indisposed. He was sorry to say that Mr. J. W. Scott was prevented by illness from being present. He understood that he was undergoing a serious operation. Mr. E. G. Smithard, of King's Lynn (the Chairman of their Commercial Section), too, was ill; he also having undergone a serious operation. He was sure all the members would wish for the speedy restoration of these gentlemen to health and strength. ["Hear, hear."]

New Members.

On the proposition of the President, seconded by the Hon. Secretary (Mr. W. H. Mainwaring, of Lincoln), the following new members were elected:

Members.

Mr. S. O. Pacey, Manager, Retford.
Mr. L. Williams, Manager, Thetford.
Mr. R. W. Calderwood, Assistant, Spalding.
Mr. J. H. Hornby, Assistant, Grays.
Mr. W. J. Mason, Junr., Assistant, St. Ives.

Associate Member.

Mr. Ronald B. Glover, Manchester.

Losses by Death.

The President said they had unhappily lost by death during the past twelve months two of their Associate Members—Mr. J. W. Broadhead and, more recently, Mr. A. Cliff. Both these gentlemen had been well known to them all, and both had earned their great esteem. Those who attended the meeting at Stamford would remember the extreme geniality of their friend Mr. Cliff. By their removal, the Association had lost two most valuable members.

As a mark of respect, the members stood in silence.

Annual Report and Accounts.

The President remarked that the annual report and balance-sheet had been circulated among the members; and he submitted them for adoption by the meeting. The only matter to which he desired to draw attention was the fact that the balance in hand had increased from £37 7s. 10d. to £75 12s. 4d. This was largely because, during the strike last year, the subscriptions continued while the expenses dropped. He was glad to find they had this amount in hand, because he was going later to suggest one excellent means of reducing it.

The report and accounts were adopted, on the proposition of the President, seconded by Mr. J. H. Troughton (Newmarket).

Institution Benevolent Fund.

The President said they had received from Mr. Walter Dunn, the Secretary of the Institution of Gas Engineers, a

letter drawing attention to the fact that the Benevolent Fund—a very admirable fund indeed—was in need of further support. He (the speaker) would be voicing the opinion of all present in saying that those who were fortunate should be willing at all times to assist those who were not so. Many persons, through no fault of their own, had fallen on evil days; and he could not conceive anything more in sympathy with the idea of their Association (which was that of helpfulness in time of trouble) than that they should be liberal towards their less fortunate fellows. The Committee had carefully considered the matter; and their recommendation was that a donation of £10 10s. should be made to the Benevolent Fund, instead of the usual £5 5s. For some years it had been his privilege to serve on the Committee administering this fund; and he knew that great care and discretion were exercised in the work. He could also from personal experience assure them that the recipients were extremely grateful for the assistance they received.

Mr. R. WARDELL (Peterborough) seconded.

An amendment, moved by Mr. C. G. GRIMWOOD (Sudbury) and seconded by Mr. W. W. TOWNSEND (Colchester), that the amount of the donation be £21 was unanimously agreed to by the meeting.

The PRESIDENT said they now came to his address; and in this connection he was venturing to introduce somewhat of an innovation. For some reason which he had never been able quite to fathom, the Presidential Address was supposed to be a thing which no one must discuss. On this occasion, however, he was going to ask the members to discuss anything he might say. Perhaps the main reason that induced him in this way to break free from precedent was the fact that he was erecting at Ipswich a new holder—the first of its type in this country. But apart altogether from this, if there was anything in his address which the members cared to criticize, he would welcome their remarks and do his best to answer them. He then proceeded to deliver the following:

PRESIDENTIAL ADDRESS

of Mr. FRANK PRENTICE, Engineer and Manager of the Ipswich Gas Company.

My first words must be to thank you all for electing me to the President's chair, and to assure you that my best endeavours will be put forth to promote the usefulness of this Association. I also wish to express my great appreciation for the assistance I have received from the hands of my Chairman, Mr. Henry Woodall, and the other members of my Board, which enables me to give you a far better time than I could have done if left to my unaided resources.

That Mr. Woodall is here to-day, puts a curb on my remarks; but I will say that besides being a brilliant gas engineer and administrator, he is also a charming and delightful friend; and we deem ourselves extremely fortunate in Ipswich to be presided over by such a distinguished ornament of the gas profession.

The perennial stream of presidential addresses with which we are regaled, or otherwise, makes it difficult to find anything worth saying that has not been said before—and probably in a better way than I can say it. I will, however, make an attempt to say a few words on matters of general interest to the industry as it is carried on in the Eastern Counties, and on gasholders in particular.

On glancing over the roll of our members, I am struck with the difference in size of the gas undertakings, from the up-to-date modern works, with all the apparatus and opportunities for good results, to the village concerns where two or three men carry out all the operations. As the latter are far in excess of the former, I propose to say a few words on the special difficulties they have to face; and as I have run one of these tiny works for many years, my sympathy goes out to them in no small measure.

First let me assure these men that those of us who control the larger works are always anxious to extend them a helping hand to the utmost of our ability. I think it is necessary to say this, because often their natural reticence prevents their obtaining the assistance we are always ready to give.

To be your own stoker, meter reader, slot collector, fitter, and a hundred-and-one other things is no sinecure; and the patient, persistent way in which such men carry on year in and year out merits our admiration and demands our help. To give but one illustration, I know of a small 6-million works where the maximum output is 32,000 c.ft. per 24 hours, where the holder capacity is 9000 c.ft., or less than one-third the output, and yet for thirty years the gas supply has never failed.

In view of the competition we are experiencing, nothing seems more important to me than cheap gas. No advertisement is half so effective with the public as a low price; and no stone should be left unturned to attain this end, providing the works are not starved to produce it.

COAL.

It is impossible to mention the word coal without commenting on the recent strike—that stupendous example of where folly, ignorance, and passion can lead vast numbers of our fellow men. The cost to the gas industry was enormous; the miners lost over two hundred million pounds in wages, besides bringing themselves and their Unions perilously near bankruptcy; while the loss to the nation as a whole defies calculation.

The additional cost of coal to the Ipswich Gas Light Company was £32,000; and if the loss on residuals and the increase in wages are included, the total reaches nearly £50,000. In spite of all difficulties, it is satisfactory to note that by mutual help the gas undertakings in the Eastern Counties succeeded in maintaining a supply of gas throughout the whole seven months' strike.

Coal is our raw material, and the quality of the coal we buy should be carefully noted, for rock, stones, or dirt are not carbonizing materials. If systematic tests were always made of each delivery, and all reasonable complaints forwarded immediately, a great step would be taken towards the day when coal, and nothing but coal, was supplied to gas-works.

COKE.

The price of gas is largely influenced by the price of coke; and I venture to suggest that we have been far from wise in our dealing with this residual in the past. On all gas-works, coke at times becomes in more senses than one a burning question. Stocks of it grow and grow, and we start a campaign for its reduction—sixpenny bags, shilling bags, and even 14-lb. bags are feverishly brought into play. And then suddenly a coal strike, or a spell of cold weather comes along, the mountain of coke vanishes—and with it our efforts to build-up a regular trade in this commodity.

In my judgment this is all wrong. If we undertake to supply (say) shilling bags of coke, and we can build-up a regular trade of this character, such customers should be as sure of their supply of coke as they are of the gas they burn. It may mean occasionally turning down tempting offers for spot lots; but in the long run a regular supply to regular customers will prove a remunerative business.

I am fully aware of the unsuitability of the domestic grate for burning coke; and while it may not be possible to alter grates, it is possible to alter the character of the fuel, and so make it more suitable for domestic use. Clean, even-sized, dry coke is a useful and economical fuel, and one that is appreciated by the average housewife; and any effort we expend in this direction rapidly brings its own reward. If such methods were universally adopted, and coke was sold where it was produced, dumping would soon become a thing of the past.

TAR.

Perhaps none of our residual products has received more attention in recent years than tar; and in the history of gas production, what at one time was its greatest bugbear, and its disposal a source of endless difficulty, has now become a valuable product, and one which, rightly handled, assists us towards our goal of cheap gas.

From a chemist's point of view, tar, with its several hundred compounds, is a fascinating study; but at the present time its value as a road-making material supersedes all other considerations. We are producers of the best, cheapest, and most enduring road building and surfacing material in the world; and it only requires our careful study, and expert handling, to prove this statement to every unbiased mind.

Every necessary quality—viscosity, durability, and elasticity—can be produced at will; and if we would reap the harvest, all possible care should be exercised to see that every gallon of tar sent out from our works will meet every requirement that the road engineer desires.

SULPHATE OF AMMONIA.

In our search for ways and means to cheapen our commodity, I am afraid that little help can be obtained from this one-time valuable bye-product. Synthetic ammonia—both English and foreign—promises to make its production by the gas industry almost valueless. Its manufacture is fast becoming a problem; and it seems likely in the near future that this once profitable source of revenue will degenerate into merely a means of disposing of gas liquor. In a matter like this, the ordinary man can only look with anxious glances to our expert chemists and research committees, in the hope that some discovery may be made that will restore the manufacture of sulphate to its old value.

WAGES.

In wages we have again a most important factor in the price of gas. Good wages demand good service; there is no room in our industry for slackers, and we cannot afford in these strenuous days to retain men who are not prepared to give a fair day's work for a fair day's pay. A careful survey of our works will often result in the discovery that four good men will do the work of five indifferent ones, provided their pay is sufficiently attractive.

Good wages produce contentment. A contented man is always a better workman, and a happier man, than a discontented one; and this applies all round, whether he be engineer or labourer. I am a great believer in what I will call the personal touch. Every man should feel that his employer is his best friend, and the one to whom he should take all his troubles. For this reason, the huge amalgamations so popular

in these days leave me cold; men become cyphers, individuality is lost, a man's very name degenerates into a number, and fruitful soil is prepared for the seeds of suspicion and distrust against those who really desire to be their best friends.

For this reason I am all out for co-partnership and superannuation schemes, sports associations, social amenities, and, indeed, everything that brings employers and employed together. I am convinced that ignorance of each other, and ignorance of our respective points of view, is responsible for any dissatisfaction and unrest that exist, and it is our business to leave no stone unturned to dissipate such mistaken views.

Time was when I believed in the Trade Union movement; but to-day, so far as our business is concerned, I think it has become unnecessary. When employers and men mutually realize that their interests are identical, that they are friends and partners in a great industry, they will not require any outside intervention to settle their differences. In saying the above I am not casting any slur on the Trade Union leaders, many of whom have high-minded views, and merit our confidence; but I am stating what I believe to be the truth as it exists to-day in our industry.

HOLDERS.

Ever since the use of gas became a practical proposition, its storage has never ceased to occupy the minds of gas engineers. Gasholders became a necessity for two purposes—first to contain superfluous gas for future use, and secondly to force the gas, by their weight, along the pipes to the point of combustion.

In times well within the recollection of many present, gasholders were inflated entirely by the pressure of the escaping gas in the retorts. Hence the lighter the holder, the more gas was produced; and it was a common practice to fit holders with counterbalance weights, by the adjustment of which the pressure was reduced during daylight hours, and increased during the hours of darkness. This process was all very well when gas was used for lighting purposes only; but the introduction of gas cookers, fires, and engines altered the circumstances, and the day load became as important as, and generally more important than, the night load. Thus other means had to be adopted to meet the altered demand; and, further, it was realized that, if the pressure in the retorts could be eliminated altogether, a considerable increase in the make of gas per ton would follow. All these advantages were gained by the introduction of rotary pumps, called exhausters, which served these purposes and inflated the holder in addition.

Almost without exception the gasholder consisted of an inverted cup, with or without lifts, rising and falling in a tank of water; and so good was it, that for 100 years it held undisputed sway. From a single inverted cup to the holder of many lifts, the principle remained unchanged, and unchallenged, until a few years ago.

Three disadvantages were inseparable from these holders. First the enormous weight of water in the tank—often running to many thousands of tons—necessitating foundations of great strength and solidity; secondly the liability of the water in the tank and lutes to freeze in wintry weather, which in some climates made it necessary to enclose the whole structure within a building; and thirdly the variation of pressure caused by the lifts cupping and uncupping. To eliminate these disadvantages without adding others has been the aim of many inventors, who each in turn found success just beyond his reach.

THE WATERLESS HOLDER.

In 1915 a German Engineer, Herr Konrad Jagschitz, conceived the idea of making a large steel cylinder in which a weighted piston should slide; its rising movement being caused by gas pumped into it, and its falling movement by the discharge of the gas into the mains. A touch of romance accompanied this conception. Herr Jagschitz was a builder of gasholders, and was well aware of their faults, and many times had sought for a solution of them. Seated one day in a cathedral, his attention evidently strayed from the proceedings, and the idea of a piston holder flashed across his mind. Whether it was the music, or the sermon, or the stained glass windows, or the ecclesiastical surroundings, he is unable to say; but I have it from his own lips that it was there the idea was born. He immediately set out to realize his dream; and after overcoming the many technical and engineering difficulties, produced his first waterless holder in 1915.

Perfection in anything is rarely, if ever, attained at the first attempt; and the waterless holder proved no exception to this rule. The wonder is—and it reflects great credit on the inventor—that only one of these holders has met with disaster. I refer to the mishap to the Posen holder, which was erected in 1916. This accident—as has been proved by the most searching investigation—was due to several causes, not the least of which was want of supervision. If an apparatus is to be condemned because of an accident to an early example, every bit of machinery that we use to-day stands condemned also.

Having discovered a weak point in the construction of his holder, Herr Jagschitz promptly remedied it; and to-day 86 of his holders are in use, both on the Continent and in the United States. I have it direct from the users of some of them that they have given unqualified satisfaction for many years. A further 24 are at present under construction.

It is not my purpose to-day to bore you with a heap of technical details, but rather to describe in simple language and as clearly as I can, the construction of these holders; what their advantages are; and why I recommended my Board to erect one. I have prepared a few sketches to help us to understand our subject.

Design.—Fig. 1 shows the shell, and the piston that travels up and down inside it. This shell is polygonal in shape—the number of sides depending on the size of the holder—and the necessary rigidity is attained largely by the shape of the plates, which are stiffened by a number of uprights, which in turn are strengthened by fish plates varying in number and thickness,

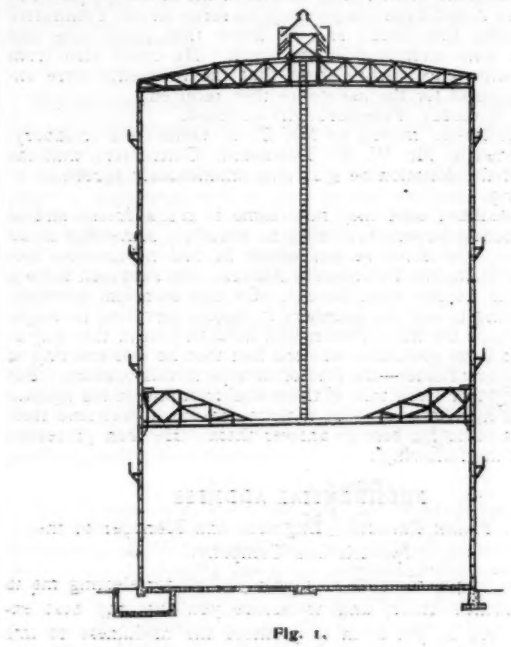


Fig. 1.

from the base to the top of the structure. A complete cylinder is thus formed, closed at the bottom by plates, and at the top by a slightly curved roof. A flat movable piston slides up and down inside the shell, rising or falling according to the contents of the holder. This piston is such an accurate fit that during erection, and before any sealing liquid is introduced, it is used to lift the roof, and temporarily becomes a platform on which the erecting cranes travel. It is blown up by air for this purpose; the leakage being negligible.

Seal (fig. 2).—When in actual use for gas storage, this piston has at its periphery a tar seal which serves three purposes:

1. Prevention of leakage.
2. Lubrication of the piston.
3. Preservation of the internal surface of the shell.

The tar seal consists of a trough on the outer edge of the piston, and is filled with tar some 2 ft. deep, which presses

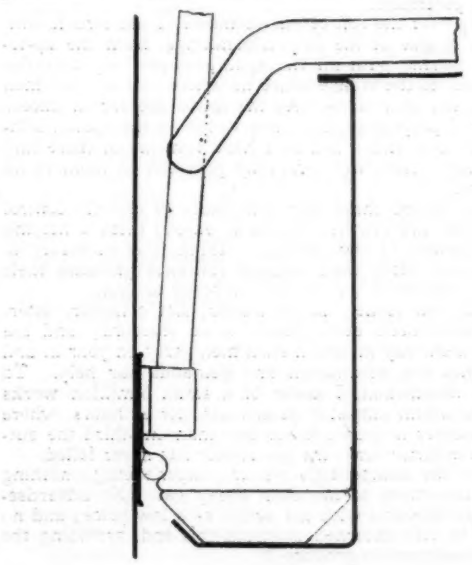


Fig. 2.

rubbing bars and shoes on to the internal wall of the shell, partly by its own weight, and partly by an arrangement of weighted levers.

The seal is maintained by a number of automatically operated electrically driven pumps situated round the base of the holder, which transfer the tar from the collecting tanks to similar ones at the top of the holder, from which it runs down inside the shell, and so always keeps the seal full.

Pumps.—These, which are driven by 2 H.P. motors, work intermittently, usually about five minutes in every three hours, according to the viscosity of the tar and the quantity that passes the seal.

The cost of running these pumps is small, as is indicated by the following figures, supplied to me by Director E. Liesching, of the Buer Gas-Works:

Year.	Current Used per Annum.
1923	368·3 units
1924	265·8 ,,
1925	217·5 ,,

The gradual reduction shown is due to the use of more suitable tar for the purpose, and also to the stabilization of the asphaltic constituents, which play an important part in the viscosity of the tar.

I also have the figures from the Durlad Gas-Works, where in five years 883 units were used, giving an average of 177 units per annum.

Pressure.—Since there are no lifts to cup and uncup, the pressure does not vary, except that there is a slight increase when the piston is in the bottom position. The pressure given can be varied according to requirements by weighting the disc; and a constant pressure up to 15 to 20 in. of water can be relied on if such a pressure is required.

The peak load is fast becoming a serious problem to many engineers; and the value of their storage during the cooking hours is often limited to one lift of their holders. The waterless type, with its constant pressure, tends in no small degree to solve this problem without mechanical aid. The Ipswich holder is arranged to give 10 in.

Cost.—The cost of these holders is less than that of the water tank type; and the larger the holder, the greater the saving.

Weight.—The weight of a 2 million spiral-guided holder with tank and water is around 18,000 tons. The weight of a waterless holder of the same capacity is around 800 tons; and from this fact a further saving in the cost of foundations may be confidently expected. The maximum pressure on the foundation ring is not more than 1 ton per sq. ft.; the pressure on the remainder being less than 100 lbs. per sq. ft.

Painting.—This is easily done; and as there are no lutes and no wind and water line, once in five years keeps them in perfect condition.

Speed of Erection.—A point well worth making is the speed with which these holders are erected. At Hamborn, near Essen, a holder of 10½ million c.ft. capacity—and incidentally the fourth ordered by this Company—was completely erected in seven months from the date when the foundations were handed over. This holder has a diameter of 221 ft., and the height to the lantern 351 ft.

It may be interesting to record the progress at Ipswich.

Foundations commenced	Oct. 13, 1926
,, finished	Dec. 16, 1926
Bottom completed	Jan. 13, 1927
Roof ,,	March 18, 1927
Piston ,,	April 8, 1927
Erection ,,	probably in July, 1927

The erection methods are an important feature of this holder, and the design and construction play no small part in the cost. After completing the bottom, the roof is erected, thus providing a certain degree of protection for the workmen. The next step is the piston, to which the roof is temporarily connected, forming an erection platform, which is blown up tier by tier as the work proceeds, and provides a continuous check on the accuracy of erection.

Another advantage may be pointed out. Because of their light weight, the holders can easily be raised 10 or 12 ft. above the ground line, and so leave a covered store over practically the whole area. Where space is a consideration, this item should not be overlooked.

Dry Gas.—The absence of water means that the gas leaves the holder as dry as it entered, which we hope to find will lessen naphthalene troubles in the district. It is also worth notice that in severe frosts no steam raising plant is required, and stand-by charges are thus avoided. There are no lutes to freeze, or snow to shift, which constitute a source of danger and serious anxiety in very severe weather.

In America as well as in Germany, over one hundred of these holders are in commission, or in course of erection, varying in size from 30,000 c.ft. to 15 million c.ft. Why English engineers fight shy of such structures it is difficult to understand. Æsthetically they may not please every eye; but when the colouring is harmonized with the surroundings, they compare very favourably with the usual type.

I have often been asked, why take the risk of experimenting with a new type? My answer is that no advance in engineering was ever made without taking risks, and, further, that any risk is discounted beforehand by the fact that scores of such holders are in successful operation to-day, and further still by the fact that the advantages are so great as to warrant any small risk that is undertaken.

As a matter of fact, I do not think there is any greater risk than with a water-sealed holder. Because a piece of apparatus has done well, there is no reason why it should not be improved. The people who speak of risks of waterless holders to-day are the same people who feared to use spiral-guided holders when they were introduced. I should be the last person to advise my Directors to take risks, but I hope I shall always be one of the first to recommend the trial of new apparatus, especially when it serves its purpose better than the old. The late Sir Corbet Woodall was, I believe, the first man to erect a holder of any size in Germany without a building to protect it. This was thought by some German engineers very risky; you know with what little reason.

I should like to point out, as my Chairman has already done to-day, that when we visited Wiesbaden together he refused to accept a German tender, saying our Company were prepared to pay a little more to an English contractor. We hoped thereby to ensure English contractors taking-up the manufacture of this class of holder. English gasholder builders are the best in the world; and will, I hope, soon be constructing waterless gasholders of the highest efficiency and quality.

Some of you have already visited the works and seen the holder I have endeavoured to describe; and I hope that none of you will leave Ipswich without seeing this unique advance in gas engineering. As already indicated, free discussion on waterless holders is desired by your President.

Selling Coke in Small Quantities.

The PRESIDENT, in the course of his address, remarked that during the morning one of the members had asked him what he was doing in the way of distributing coke. In Ipswich they were supplying to the public 1s. bags of coke. Selling in this way, and not by weight, enabled them to vary the quantity of coke supplied for 1s. according to the price at the moment. They had sold as little as 32 lbs. in a 1s. bag, and at other times as much as 56 lbs. Just now the amount was 44 lbs.; and the result was quite satisfactory. The quantity per day which a man could dispose of was from 2 to 3 tons; but there were several important points to be borne in mind. One was that the coke should always be sent to a particular district on the same day of the week, so that the persons it was desired to secure as regular customers might know when to look out for it. In order to expedite delivery, the Company issued small cards, with the request that those who wanted coke should exhibit one of the cards in a window. This resulted in a great saving of time on the part of the men who delivered the coke. It was a common occurrence, if the weather was cold, for a lorry to go into a street and remain in one spot until 1 ton or 1½ tons of coke had been sold to the people who were expecting it. The best result so far attained had been 30 tons a week; but he thought this figure could be very considerably improved upon. Above all things, it was essential that the supply should be regular.

Discussion.

Mr. C. E. WRIGHT (Works Manager at Ipswich) said he was watching the erection of the new holder with the utmost interest. As each day passed, he became more and more impressed with the excellence of the design and the extraordinary foresight which the German patentee had manifested. The holder had been lifted a few days ago; and although there was no tar, paint, or anything but steel to steel, the leakage was negligible. There was, in his opinion, nothing about the holder with which any engineer could find fault as an engineering job. It was hoped to have it completed by July 31, according to plan. Those who visited the Ipswich Gas-Works now would see something which would very frequently be seen in England in the near future. Mr. Prentice had been complimented upon his pluck in being the first to decide upon a holder of this type in England; but this suggested danger, and he (the speaker) thought there was no danger at all. Really he was running no risk in putting it up; and without doubt the holder would work satisfactorily for many years to come.

Mr. W. W. TOWNSEND (Colchester) said they would all desire to be fair, and to consider a new proposal of this kind on its merits; and he thought the President might have put several more disadvantages to the debit of the type of holder to which they were all accustomed. One thing with which they were painfully familiar was the corrosion of the lute plate in each lift. A holder might last 40, 50, or 100 years; but in course of time the lute plate was going to give trouble, and when it did do so, an awkward problem was presented for dealing with. This was one of the drawbacks to the system to which they were accustomed. The President had told them that if necessary the pressure thrown by the waterless type of holder could be increased. The Ipswich holder was arranged to give 10 in.; but it had not been stated by how much this could be increased. Of course, this did give a certain amount of desirable elasticity. At the same time, it was not a difficult thing to put in a booster plant to increase the pressure of the existing type of holder; and Mr. Prentice still would have to use some means of getting the gas out of his present holders, if he wished to use it at the peak of the load. Ordinary holders did not give, unaided, sufficient pressure for the peak load. They were putting down a boosting plant at Colchester, and the cost was quite small. It was stated in the address that the cost of these holders was less than that of the water tank type. No doubt, the President was alluding here to the structure itself; and in addition there would be a saving on the

foundation. Some idea of the extent of the saving would add to the interest of the address.

DRY GAS.

Perhaps the part of the address which made the greatest appeal to him (Mr. Townsend) was that which referred to the question of dry gas. Naphthalene ought to give no trouble anywhere nowadays; it could be completely eliminated. But there still remained the problem of water in gas, which anyone connected with the distribution department would tell them was a nuisance both to the consumer and to the gas undertaking. A holder in which the gas was not exposed to water certainly offered great advantage in this respect. If they were going to dry their gas completely, this would cost less if it had not been previously saturated over a tank of water.

Mr. C. B. DONKIN (Chesterfield) asked what happened when the piston reached the top of the holder, and also whether there was any outside indication of the position of the piston.

THE QUESTION OF TAR.

Mr. H. C. SMITH (Tottenham) said they were all grateful to the President for his courage in recommending to his Board the erection of what was to this country an entirely new type of holder, and also for the clear manner in which he had explained to the meeting the construction of the holder. With regard to the tar, were the pumps operated automatically, or was it necessary for someone to start them every three hours, or as often as might be needed? He assumed that it was essential to use a special kind of tar. Could the President give them any idea of the specification of this tar, and tell them whether it could be easily prepared on a gas-works? In connection with the question of dry gas, he pointed out that there was now a plant in operation at a works in the West of England, with which the gas was being dried by means of calcium chloride. After the gas was dried, it was necessary to put oil on the water of the gasholder; but those of them who had tried this plan knew the trouble there was in keeping the oil there. ["Hear, hear."] If the dry gas process was going to prove as advantageous as it promised to be, the use of such a holder as the new Ipswich one would solve all the outstanding difficulties with regard to it.

THE SEAL.

Mr. E. W. SMITH (Chelmsford) asked whether the President had taken into account the character of the tar and its effect on the canvas used. The seal might work perfectly well over a period; but he wondered what was going to be the state of affairs after a number of years. They were told the leakage at present was negligible; but would it remain so?

COAL COST, LESS RESIDUALS.

Mr. J. W. AUCHTERLONIE (Cambridge), proposing a vote of thanks to the President for his address, referred to another portion of it. Mr. Prentice, he said, had told them that in consequence of the strike the additional cost of coal to the Ipswich Gas Company had been £32,000, and that if the loss on residuals and the increase in wages were included, the total reached nearly £50,000. His own experience had been that the gain in residuals to a considerable extent nullified the increased cost of coal. On the subject of pressures, he did not know that it was desirable to work up to the very high pressures hinted at in the address. He thought something ought to be done to alter the mains, rather than that they should have to resort to very high pressures, which would give rise to complaints due to the upsetting of the fine adjustments of burners. A high-pressure trunk main, with the pressure broken down at suitable points, seemed to him the most desirable plan. He (the speaker) was now building a 3 million c.ft. holder with tank and guide framing. He was one of those men who thought it was better to be safe than sorry. [Laughter.] However, the President was a man of great courage. They all admired him, and wished him every success with his new holder.

QUESTIONS ANSWERED.

The PRESIDENT, having expressed his gratification at the manner in which his address had been received, proceeded to reply to points raised. He could not say how long the canvas would last. All his inquiries had revealed was the fact that it had never so far been renewed. Perhaps Mr. Chaloner could enlighten them on this subject.

Mr. J. L. CHALONER (Messrs. John Le Boutillier, Ltd.) said that was a difficult question to answer, inasmuch as the waterless type of holder had at the present time been in operation only eleven years. The experience gained during this period had revealed nothing to indicate that the life of the canvas would be less than the life of the holder.

The PRESIDENT said the fact of the matter was that these holders had not been in use long enough for the canvas to become exhausted. Mr. Townsend had made some interesting remarks regarding the lute trouble which was consequent upon the use of the ordinary type of holder. The canvas lute could be taken right out and renewed from inside without any serious stoppage of the holder. It would be necessary to let the piston go down; and judging from the time it took to put-in the canvas lute in the first place, the holder would not be out of commission for more than about twelve hours. To what extent could the pressure be increased? Well, this was a point which he was afraid he could not answer. What he had stipulated was that the piston should be constructed of sufficient strength to give 12 in. pressure, though he only required 10 in. He imagined that if it was desired to have a holder to give 20 in. pressure, this could be done by making the piston proportionately stronger. The cost of the holder now being erected was £22,800; the Gas Company providing the foundations. Thus it was a fair comparison with the ordinary type. The saving on foundation work was important. In their case the foundations had cost £1743; but he had no hesitation in saying that, were he going to put up a similar holder to-morrow on the same site, he would not spend more than £1000. He had naturally been rather nervous of under-doing anything; and the foundation he had put in was vastly in excess of what there was any real need for. But in spite of these additional precautions in the matter of width of the foundation ring and extra quality of concrete, the cost had been comparatively very small. Had he been going to put up a holder with water tank, being near the docks, he would have had to pile; and in that case he reckoned the foundation costs would have been round about £5000. Of course one could not see the piston in the holder going up and down; but supposing it went up too high, ventilators were provided which would allow any gas to escape. What, however, was more important was that there was a cleverly designed indicator, by which the contents of the holder were clearly shown.

The tar pumps were entirely automatic. They got to work as soon as the tar reached a certain level; and each pump operated roughly about five minutes every three hours. Supposing one or more of the pumps went wrong, the remaining ones would work a little more often. One pump alone would keep things right for a day or two while necessary repairs to others were being undertaken. They operated very easily, and were electrically driven. Another pertinent question was as to the type of tar to be employed. Various suggestions had been made with regard to this matter. One was to use oil. Tar, however, was an eminently suitable material for the purpose. It would not easily under the conditions involved become emulsified. It contained certain asphaltic compounds; but after a definite period these compounds became static. The Company were at present busy trying to evolve a tar which would remain of the same viscosity and the same nature over possibly many years of work. There had been certain products made in Germany which were eminently suitable in every way but one as a seal for these holders. This one point, however, was exceedingly important. They were lighter than water. With a material lighter than water, any water present would sink to the bottom; and in very cold weather a block of ice would form in the bottom of the lute, and trouble would be bound to result. Therefore, a material heavier than water was necessary, so that any water formed would remain at the top, and be taken off in a little apparatus called a skimmer. As to drying gas, this should be accomplished after it came out of a water-tank holder. He could not quite see the object of drying gas before passing it into a holder over a water-filled tank. If the holder had not this steamy vapour inside—and the waterless holder had not—then they could dry the gas at which point they preferred.

In the matter of residuals during the strike, he had not had Mr. Auchterlonie's happy experience. Coal had come into his works which produced no coke at all—nothing but breeze, and poor breeze at that. Thus the loss on residuals had been serious, in addition to the extra price that had to be paid for coal. Mr. Auchterlonie had then gone on to say that he was erecting a 3 million c.ft. holder, and was sticking to the old-fashioned methods. He had every sympathy with this view; but if they all followed this example, there would not be very much progress. He (the President) might have been rash, though he did not think so; and if in four or five years' time he was convinced of his imprudence, he would be quite prepared to come before them all and admit it.

PLACE OF NEXT MEETING.

Mr. AUCHTERLONIE said he would like to propose that the next meeting be held at Cambridge. He had promised Mr. Prentice when he took the chair that he would endeavour to arrange an autumn meeting at Cambridge. His Directors cordially supported him, and agreed to entertain the members; but unfortunately last year the proposal had to be abandoned. His Board had, however, kindly agreed that the invitation should be renewed for a day to be fixed upon during next autumn.

The PRESIDENT, on behalf of the members, expressed thanks for so welcome an invitation.

At the conclusion of the meeting, tea was served in the Library.

SUBSEQUENT PROCEEDINGS.

A thoroughly enjoyable evening was spent on Thursday, at the Crown and Anchor Hotel, where the Association had their annual dinner, with the President in the chair.

On Friday morning the gas-works were open for inspection, and the showrooms of the Company; while the President announced that a special invitation had been received from Mr. Reavell (who was himself unfortunately prevented by indisposition from being present) to the members to visit the Ranelagh Works, Ipswich, where there are manufactured compressors and exhausters for gas and air, suitable for all purposes connected with the gas industry, including turbo compressors for large capacities.

In the afternoon, there was excellent golf for those able to stay and take part in it.

THE SHOWROOMS.

On either side of the main entrance to the showroom is a spacious window for displays; and attention is further directed to the premises by excellent exterior lighting, which is effected by 1500 c.p. Keith-Blackman high-pressure lamps. Entering, one is faced by the counter (arranged at the other end of the showroom) at which consumers may pay their bills. Every effort has been made to avoid overcrowding of goods. Down each side, almost from door to counter, near the centre of the green and white marble floor, is a platform on which well-selected samples of the most modern appliances, by the leading makers, for cooking, warming, water heating, and other domes-

tic purposes, are set out. The showroom is handsomely fitted with oak; being provided with 12 ft. high Georgian panelling. In a deservedly prominent position is a feature which strikes all those entering the premises who have a knowledge of the history of the Ipswich Gas Light Company—that is, a first-rate portrait in oils of the late Chairman, Sir Daniel Ford Goddard. A handsome staircase leads up to the Engineer's and the Secretary's offices.

THE GAS-WORKS.

The Ipswich Gas-Works are very modern and up to date in every phase of activity. The entrance takes one under a fine works hall, which is provided with piano, wireless, and library, for the use of the employees; and evidence of this consideration for the workers, male and female, is frequently met with wherever the visitor penetrates. The works are admirably situated from every vital viewpoint. With the dock at the gates, and a river running direct to sea, there are splendid facilities for the reception of sea-borne coal. In fact, coal boats up to 2000 tons can be discharged expeditiously and efficiently by a modern system of unloading.

The gas production capacity of the present works is upwards of 4½ million c.ft. per day; and the largest 24-hour output is 3·2 million c.ft. There are Woodall-Duckham vertical retorts, of a capacity of 2½ million c.ft.; horizontals, 1¾ millions; and water gas plant, 1 million per day. Most of the general plant is of normal design, and so calls for no special comment.

The gasholder capacity has up to this year been rather inadequate for such a large works, being only 1½ million c.ft.; but, as already pointed out, this state of affairs is being remedied by the erection of the new 2 million c.ft. tankless holder. The site of this holder is separated from the works by the width of a normal road only, so that it is conveniently situated for access and supervision.

The works generally give one an impression of freedom from dirt and much of the discomfort sometimes found in such places. Smoothness of working and lack of friction (in the wider sense), unfailing signs of good management and able administration, are everywhere observable. In short, Ipswich, as a fine old town, is deserving of a gas-works of outstanding merit; and it can safely be said that in this respect it has its deserts.

SUPPLY OF GAS TO WAR DEPARTMENT BUILDINGS.

The following is a report of the meeting of representatives of gas supply undertakings interested in the subject of the supply of gas to War Department Buildings which was held at 28, Grosvenor Gardens, on Wednesday, April 13, 1927 (Mr. F. W. Goodenough in the chair), for the purpose of discussing a suggested draft agreement and report prepared by the British Commercial Gas Association (and circulated prior to the meeting) dealing with that problem.

It was reported that, since the draft agreement was circulated to gas undertakings, an important amendment to Clause 8 had been agreed with the War Office, and that the revised Clause was now as follows:

> *Clause* 8.—The Company will lay and fix such supply pipes or apparatus only in such a manner and in such position as may be approved by the Chief Engineer or his representative, to whose satisfaction the work in connection therewith shall be completed. On the removal of all or any of the said apparatus the restoration of the walls, floors, or any other parts of buildings made necessary by negligence in course of such removal shall be carried out immediately after removal by and at the expense of the Company to the satisfaction of the Chief Engineer or his representative.

There was a full and interesting discussion of the agreement; and the following is a summary of the principal points of the discussion and the final and unanimously agreed line of action.

(1) The draft agreement made no provision for the liability of the maintenance of existing mains.

(2) In many cases existing mains are in such a condition—particularly with regard to leakage—as to make it unprofitable for the gas undertaking to take them over from the War Department. One particularly serious aspect of the matter was the frequent practice of "tapping" mains by unauthorized parties, and the resultant inability of the gas undertaking to secure payment of the gas so used. Unless the War Office were prepared to pay the difference in the amount of gas registered on the main meter as compared with that registered on the meters in "married quarters," &c., the position was impossible.

(3) *Clause* 2.—While an undertaking could give plans of mains, it was not always possible to include services, and in any agreement that might be entered into plans should be limited to piping of not less than 3 in. diameter.

(4) *Clause* 16.—Provision of large-scale maps might present difficulty to small gas undertakings.

(5) In those areas where buildings on War Office land were scattered over wide and large areas, the cost of mains was a serious item. If a gas undertaking is to consider incurring the capital outlay for the main, then it would need some guaranteed return on its capital. As things are at present, owing to the frequent change in personnel, there is no one in authority from whom such a guarantee can be obtained.

While it was recognized that the suggested agreement was much more satisfactory to gas undertakings than many other agreements entered into by the War Office, and referred to by the War Office as "the last word" in concession, it was finally resolved that in the opinion of the meeting no general form of agreement was possible, and that individual undertakings should be left free to negotiate their own terms, having regard to local conditions, &c.

It was agreed that undertakings should be requested to furnish the "B.C.G.A." with copies of agreements made within the past three years, and to notify the Association of important points in current negotiations or difficulties encountered.

It was further resolved to appoint a special committee composed of Messrs. F. W. Goodenough; C. Valon Bennett (Rochester); G. S. Eunson (Northampton); and W. H. Becket (London), who would endeavour to arrange a conference with representatives of the War Office, and put before them all the facts with regard to the use of gaseous fuel in barracks, &c.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

The Fifth Annual General Meeting of the Wales and Monmouthshire Junior Gas Association was held at Newport (Mon.) on Saturday, April 30. In the absence of Mr. C. Bateman (Bath), Mr. T. V. BLAKE (Cardiff), Senior Vice-President, took the chair.

The HON. SECRETARY (Mr. A. E. Martin, Merthyr Tydfil), in presenting the Council's Annual Report, gave the membership list as one honorary member, 101 ordinary members, and 10 associate members.

Thanks were accorded the Wales and Monmouthshire District Institution of Gas Engineers and Managers for their gift of prizes to members who obtained examination successes last year, and who delivered papers during the previous session.

Mr. H. D. Madden (Cardiff), Mr. J. H. Canning (Newport), and Mr. T. Canning (Woking) were also thanked for their gifts to the library.

The HON. TREASURER (Mr. A. H. Shepherd, Swansea) said that the year's working had resulted in a small balance in hand.

After thanks had been given to the officers and Council for their services, the following were appointed for the ensuing session:

President—Mr. T. V. Blake, Cardiff.
Senior Vice-President—Mr. C. B. Felton, Newport (Mon.).
Junior Vice-President—Mr. G. H. Hughes, Chepstow.
Hon. Secretary—Mr. A. E. Martin, Merthyr Tydfil.
Hon. Treasurer—Mr. A. H. Shepherd, Swansea.
Hon. Librarian—Mr. F. H. Osborne, Cardiff.

Messrs. T. Noall (Cardiff) and R. W. Foster (Cardiff) were reappointed Auditors, and Mr. C. S. Thane (Newport, Mon.) was elected to fill a vacancy on the Council.

Tea was provided by the Chairman and Directors of the Newport Gas Company, to whom a vote of thanks was passed on the proposition of Mr. BLAKE, seconded by Mr. F. H. OSBORNE (Cardiff).

Coal Cleaning Conference.

A coal cleaning conference is to be held under the joint auspices of the Society of Chemical Industry (Fuel Section), the Institution of Gas Engineers, and the Coke Oven Managers' Association in the Medical Buildings, Edinburgh University, on July 7, from 11 a.m. to 1 p.m., and from 2.15 p.m. to 5.15 p.m. The chair will be taken by Dr. C. H. Lander. The following papers will be presented: (1) "Comparison of Processes for Cleaning Coal," by Dr. W. R. Chapman and Prof. R. V. Wheeler, D.Sc., F.R.S. (2) "Froth Flotation Applied to a Baum Washer," by Mr. Walter Guider. (3) "A Consideration of Certain Problems Encountered in the Preparation of Coal for the Market," by Mr. F. S. Sinnatt, M.B.E., M.Sc., F.I.C. (4) "Notes on the Cleaning of Coal, with Special Reference to Pneumatic Separation," by Mr. C. W. H. Holmes, M.Met. All interested in this subject will be welcome at the meeting, but those intending to attend should communicate with the Hon. Secretary of the Fuel Section of the Society of Chemical Industry, Central House, Finsbury Square, E.C. 2.

STEAMING IN CONTINUOUS VERTICAL RETORTS—THEORY AND PRACTICE.

I.—PRELIMINARY OBSERVATIONS.

By NORTON H. HUMPHRYS.

That people believe in the value of steam in connection with vertical retorts worked on the continuous system is proved by its universal acceptance as a means of securing improved yields per ton of coal carbonized, both of therms and of cubic feet, as compared with other methods of working. The continuous vertical retort without steam is like the play of Hamlet *minus* the name character. No gas engineer has adopted the one without the other, or been known to reject the useful auxiliary after a fair practical trial.

The Fuel Research Board, the Institution of Gas Engineers, the leading research chemists attached to staffs employed by the principal gas undertakings, and the manufacturers of plant, have given an immense amount of attention to the subject, though not more than it deserves. The results of their labours have been published with such wealth of detail that the average gas engineer has a poor chance of affording the leisure necessary for keeping fully in touch with the enormous amount of literature that is devoted to the subject. To many of the smaller class of gas-works who have "scrapped" their horizontal retorts and accessories, one inducement was that the new system, if not absolutely foolproof, would be simpler in operation, and require less technical supervision. With increasing responsibilities in the district and sales department, this is a consummation devoutly to be wished. Unfortunately, a few years' experience goes to show that absence of chemical control and technical attention to detail is not consistent with the full attainment of the best possible working results, or with the careful nursing demanded by an expensive installation. Neglect in these respects may open the way for some of the difficulties that have caused steaming in horizontals or of intermittent charges to be rejected as a practical failure.

As quite a large proportion of the total make of gas throughout the country is now produced by continuous vertical retorts and steaming, some comparisons and considerations as between theory and practice may not be out of place. The construction applied to the word "theory," for the present purpose, will be further explained; and "practice" will be regarded as representing the conditions obtaining in course of every-day gas-works routine, not of such magnitude as to warrant the employment of the leading engineers and chemists obtainable, but conducted on the lines common to undertakings producing 100 to 200 million c.ft. of gas per annum.

Special tests or experiments conducted on a large scale with apparatus similar to that used in gas-works, but also accompanied with refinements only possible in a fully-equipped laboratory, on consignments of a few hundred tons specially supplied for the purpose, in a plant tuned-up to concert pitch for the occasion, including auxiliaries that are not available for every-day working, occupy an intermediate position. They should not in any sense be disparaged on that account, as they furnish excellent service by construction of ideals to which the practical man may closely approach. Given favourable conditions, they may be nearly equalled; but conditions, like many other things, are not evenly distributed—a fact that should not be overlooked when making comparisons of the results obtained at one gas-works with those from another.

Some gas engineers are not above interpreting favourable circumstances as an equivalent in personal energy or ability, and in appropriating credit that they do not honestly deserve. The converse also hold good. Some unfortunates are handicapped by local disadvantages that may erroneously be ascribed to laxity or incompetence. In course of every-day working the engineer may be compelled to accept a quality of coal that he knows to be unsuitable; and both conditions of plant and handling are influenced by circumstances other than those conducive to the best results. He is harassed by variable qualities of coal and coke, by excesses in air supply, intermittent accumulations of incombustible matter, and other difficulties inseparable from use of solid fuel, interruptions caused by duties in other departments, and the absence of accurate methods of observing temperatures, measuring steam, and weighing coal and coke. Satisfactory determinations of these and other items appear essential.

The use of large overhead storage hoppers rather complicates matters, as coal cannot be weighed direct into the retorts. Regular analysis of the gas at intervals seems to be desirable, and if made by an assistant who has experienced little or no laboratory training should be checked for accuracy by both observed and calculated calorific value and specific gravity. The complete separation of tar from ammoniacal liquor is uncertain, especially where a disused gasholder tank of comparatively large diameter is used as a general store tank. In this connection, a dipping tube as used at tar distilleries for taking whole-depth samples of the contents of railway tank wagons will be found useful.

THE THEORETICAL REACTION.

The theoretical view of steaming is based on the reaction $H_2O + C = H_2 + CO$, by which the whole of the steam combines with carbon in the coke, and is converted into combustible gases. In all plants of cupola type intended to produce so-called water gas from steam and coke, the securing of this reaction to the extent of 100 p.ct. is the objective; but as applied to retorts, and combined with destructive distillation of coal, this is far from being the only consideration, whether on continuous or intermittent working. As applied to coke and alternate runs and blows, other reactions are also concerned; and this applies with greater force to the continuous system of carbonization.

Taking the reaction by itself, without regard to possible disturbing influences, 18 lbs. of water (steam) should combine with 12 lbs. of pure carbon (ordinary gas-works coke contains 85 to 90 p.ct.) and form 2 lbs. of hydrogen and 28 lbs. of carbon monoxide. In terms of volume, equal parts (378 c.ft.) of each gas are formed—756 c.ft. in all. One-hundredth part of a ton (22·4 lbs.) of steam will take up 14·9 lbs. of carbon, and form 2·49 lbs. of hydrogen and 34·86 lbs. of carbon monoxide (by volume, 470 c.ft. of each gas—940 c.ft in all).

An excess of water vapour is always present in the gas-works retort, as shown by the separation of large quantities of water in the foul main and condensers; hence the usual practice of dealing with gases at the British standard of 60° Fahr., 30 in. Hg., and in saturated condition, as adopted by the Fuel Research Board and the Gas Referees, is adhered to throughout this communication, unless otherwise specified. If a dry gas, under these conditions of temperature and pressure, is exposed to excess of water, either as steam or in liquid state, it increases in volume to the extent of 17·6 parts in 1000, and in weight by the addition of 5·77 grains of water (Hygrometric Tables, by James Glaisher, F.R.S., XI. and XII.). Being in an extremely attenuated condition, the weight of the vapour is only about one-sixth that of hydrogen, which is the only gas affected to a serious extent by the difference between dry and saturated conditions. With ordinary town gas, or air, the difference is so slight that it is frequently neglected. The weight of 1 c.ft. of dry air is 536·3 grains, and of saturated air 532·7 grains (*ibid.*, X., XIV.).

We are therefore more immediately concerned with saturated gases, such as would be obtained when the theoretical reaction takes place in the presence of water in excess. The expansion in volume and addition to weight as above mentioned will increase the weight of hydrogen per c.ft. to 0·006 lb. ("Gas Journal" Directory, 1927, page 86), consisting of hydrogen 0·0052 lb. *plus* water 5·77 grains, equal to 0·000825 lb. The carbon monoxide will only advance about 1 p.ct., from 34·81 to 35·19 lbs. The volume will be 478 c.ft. of each gas, 956 in all. The calorific value will be slightly more than 3 therms, so 10 p.ct. of completely decomposed steam might add 30 therms per ton of coal carbonized to the gas. These figures are not to be accepted as strictly accurate, as authorities do not agree within 1 or 2 p.ct. on the correct weights, measures, and calorific values. As much might be expected in view of the practical difficulties attendant upon obtaining individual gases in a condition of 99 p.ct. pure.

That the theoretical reaction is never completely obtained in coal gas retorts is evidenced in the following tables,* also that it is far from being the only benefit to be gained when coal is a staple material. Diluting and conserving actions are a close second. These are the leading advantages, but there is also a more regular production of gas as regards both quantity and quality—an important feature where storage is small, and in any case admitting a closer margin above the declared calorific value; the quality both of coke and of tar is improved; the absence of steam and of smoke in the retort house not only benefits the workers immediately concerned, but also avoids complaints and prejudices among neighbouring residents.

In all questions relating to balancing the total weight or volumes of the products against those of the staple material, the steam admitted into the retort should receive equal appreciation, and be as carefully determined as the coal. A ton of coal *plus* 2 cwt. of steam should yield 22 cwt. of products, and should not be confounded with the results obtained from 20 cwt. of coal alone. The steam cannot be had for nothing, like air or water, but requires expenditure of fuel for its production. I have some recollections of a lively correspondence in the columns of the "JOURNAL"—at a time when "writing to the papers" was more in vogue than at present—in which one well-known engineer cast ridicule on another, as having claimed to be capable of extracting 22 or 23 cwt. of products from 20 cwt. of coal. A clear distinction should also be drawn between genuine products from the staple material and such extraneous matters as air or furnace gases, whether introduced intentionally or by accident. There is no special credit about adding 10 p.ct. or so of nitrogen to the gas. At a time when yields of gas per ton of coal were confined within a 10 p.ct. margin, as regards both quality and quantity, and 14 candles

* The tables will be published with the next portion of this article.

was the accepted official standard so far as 90 p.ct. of the gas was concerned, percentages were a convenient unit for comparison, and answered almost every practical purpose. Technical attention was practically confined to the cubic foot. But modern requirements call for something more complex and elastic than can be provided by any single unit. The make per ton is now extended beyond the original 11,000 or 12,000 c.ft., and may include anything up to complete gasification. In a legal sense the therm has eclipsed the sperm candle of six to the pound; and the 14-candle standard has made way for a wide range of declared calorific values. Some problems can be better handled in terms of weight than of volume, because the pound covers a larger quantity than the cubic foot, as may be seen by comparing the two sections in Table I. The compounds concerned differ so widely in specific gravity (from 0·07 for hydrogen, up to 3 or so for hydrocarbons other than methane), that neither weight nor measure taken alone will entirely cover the ground.

The products of carbonization of coal invariably include additions to the staple material, consisting of extraneous stowaways such as air and furnace gases. While not entirely avoidable, they are sometimes designedly increased, for the purpose of conforming to a low declared calorific value. As a clear distinction between genuine and spurious material is essential to correct comparisons, a prominent feature in the tables is a separation of combustible from incombustible constituents. A difficulty attending all carbonizing operations is that coal is not homogeneous in composition either in a chemical or a physical sense. Some materials are uniform in both respects, but samples from the same cutting in the mine may present important differences that affect the working results. The same may be said of the products, which even under the strictest control obtainable will exhibit strange variations. The elaborate investigations conducted by the Fuel Research Board and the Institution of Gas Engineers do not entirely meet requirements, because physical conditions such as size, shape of lumps, and proportion of dust, are not exactly on all fours in any two parcels. Some approach to uniformity may be possible in consignments of a few hundred tons supplied to order for experimental purposes; but in every-day practice the coal is necessarily subject to wide differences in extent of handling, transhipping, mechanical agitation, grinding during rail or water transit, exposure to weather, and in storage for any period between a day and a year or more. All these contingencies leave their marks on both quality and quantity of the products. Breaking machines are a necessary adjunct to vertical retorts and mechanical charging, and no doubt improve the working results. The effects of preliminary treatment, including breaking, conveying, storing in large hoppers, and feeding arrangements, also influence segregation. Unfortunately, the lumps have a sort of natural tendency to take one direction, and the fines another.

These matters acquire more importance in the continuous vertical than in the intermittent systems, in which the material, once placed, remains undisturbed until the charge is spent. With the continuous vertical system, the charge is continually moving downwards at a slow and decreasing speed, perhaps starting with 2 ft. per hour at the top and finishing with 1 ft. at the bottom. The taper of the retort should be sufficient to allow free expansion of the coal without binding, which may cause both hanging up and void spaces. Almost every description of bituminous coal has its special proportion of expansion. Appreciable quantities of dust, if present, will either trickle through direct to the coke chamber, or coalesce in large chunks, which affect temperature and other conditions, and leave their influence on both quality and quantity of the several products. One large undertaking has adopted the plan of setting aside the fines for use in horizontal retorts; but those who have a reserve of this description are in the minority. During the recent coal shortage, when the selection of a suitable coal was not possible, some of the material purchased at a panic price had to go to the boiler house.

At the temperatures usual in vertical retorts under ordinary operation, the extent of time-contact possible during a course including 25 ft. perpendicular travel, and constant presence of carbon in excess, conditions appear favourable to complete decomposition of steam, and the formation of 100 p.ct. combustibles. The charge goes down at decreasing speed, but the gas follows a contrary course. Starting at the bottom, the upward movement is slow at first, as in that locality there is little more than residual coke gases and undecomposed steam; but acceleration of speed is assisted both by diminishing horizontal section, and by constant additions of nascent gases, until a maximum is attained at the point where the gases finally leave the coal. Published results agree that there is a limit to steam-decomposing capability. When 5 p.ct. is not exceeded, decomposition is complete; but advance beyond this limit is attended with an accelerated rate of wastage. As much as 12 or 13 p.ct. has been converted, but not without considerable excess. If 30 p.ct. of steam is admitted, about half goes into the ammoniacal liquor well.

(To be continued.)

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

A visit to the Kirkcaldy Corporation Gas-Works took place on Saturday, April 23.

The Kirkcaldy Works.

The installation of Woodall-Duckham vertical retorts erected in 1922 comprises 16 retorts of the 5-ton type, arranged in 4 settings; each setting being provided with a step-grate producer and regenerator. The nominal capacity of the plant is 1,444,000 c.ft. of gas per diem. Steam superheaters which pass through the bottom of the setting are arranged at the clinker stage level, where the steam is introduced by means of firebrick nostrils.

Coal is delivered in carts or motor lorries, passes over an Avery 15-ton weighing machine, and is then discharged into a steel receiving hopper, whence it is mechanically fed by a jigging screen to a Jeffrey single-roll coal breaker. The mechanical feeder is arranged with by-pass shoots to deliver small coal direct to a rotary filler. The retort house conveyor, of the Babcock and Wilcox gravity bucket type, is of 25 tons per hour capacity. It elevates the broken coal to overhead storage hopper level, and by means of a travelling two-way shoot delivers it into the several storage compartments.

The coal breaker jigging screen and conveyor are driven by a 26 B.H.P. "National" gas engine in duplicate.

Adjoining the station meter house are the Bryan-Donkin compressors, arranged in duplicate. By these, gas is boosted to Thornton and Kinghorn; the plant being capable of compressing to 8 lbs. per sq. in.

Following the inspection of the plant, the visitors were entertained at tea in Anthony's Hotel by the Corporation.

The President (Mr. Darling, of Cowdenbeath) thanked the Corporation and Mr. Jas. Kincaid, the Engineer and Manager, for the hospitality extended.

Mr. Kincaid replied; and thereafter four "paperettes" were read.

SOME EXPERIENCES DURING THE COAL STRIKE WITH FOREIGN AND OTHER COALS.

By Robert L. Laing, of Brechin.

At the Brechin Gas-Works, our vertical installation is of the Woodall-Duckham type, with six retorts each of 3½ tons capacity per diem. This installation has proved of great service; and the elasticity of coal throughput, coupled with the ease of regulation, was a decided advantage.

Full opportunity was taken in Brechin for some time previous to the strike to lay-in a supply of coal; and on May 1 our stock, consisting entirely of double and treble nuts, was sufficient to cope with 14 weeks' normal gas supply. As it turned out, however, the demand increased so quickly that it shortened that period by at least a fortnight. During the months of June, July, and August, we showed an average increase of 11 p.ct., for September 20 p.ct., and for October 15 p.ct.

Silesian Coal.

Our first consignment of foreign coal arrived at the beginning of August, and was Silesian. We had heard that this was a fairly heavy coking coal, and took the precaution to have all retorts scurfed previous to using it. Some of the consignment was fairly big coal, but this was a small percentage. It had all to be hand broken, as we have no breaker. The results were fair as far as yield of gas was concerned; and we were able to maintain 17,000 c.ft. per ton, though the quality at times was below the average. We believe in maintaining a full storage supply in our coke bunkers—a supply which normally would last six or seven days. The coke from the Silesian coal would not give the amount of producer gas required; and heats began to drop quickly. Instant action was necessary; and the coke supply to the producers was doubly riddled 1 in., and only the larger coke was used. At the same time, the steam and water supplies to the producer were greatly reduced; and at times no steam was admitted at all. These expedients proved of value, and made a decided improvement in the heats, though the latter were not up to standard. During this time we were working nothing but Silesian coal, and at lower heats. Consequently the output per retort was lower. We were, however, able to hold our own. We decided to light-up the second producer and another retort. Our installation is so constructed that either of the two producers can supply its own or the opposite side of the bench. This arrangement proved of great service; and subsequently we kept both producers going until we were back on good coke.

With this class of coal it was hardly possible to work the vertical retorts on the continuous system. It was really inter-

mittent for the greater part of the day, as for hours the extracting gear was never used, the doors alone being utilized to withdraw the requisite amount per hour. There was little good coke of any size; and from the first 200 tons of Silesian coal we had approximately 70 tons of breeze in stock, over and above the breeze used for steam-raising. When the retorts were working so spasmodically, we found our arrangement of ground floor indicators of great value—a sudden slip, or perhaps some larger coke on the extractor, being noted immediately, and attended to without recourse to frequent climbing of stairs.

American and Other Coals.

After Silesian coal we had delivery of other foreign coal, notably American Kanawha; but home coals were also available, and we were able to mix to a certain extent, and counteract any abnormal behaviour as far as small coke and slipping in the retorts was concerned. The bulk of home coal received was heavily coking—coal such as Kingshill, with which I daresay most of you have had experience. This coal produced an excellent coke eminently suitable for the producer.

With the coking coals, the exact opposite happened compared with Silesian. The extracting speed had to be increased, and at times the extractor had to be turned by hand to get the requisite amount of coal throughput. On occasions the coke had to be assisted out of the discharging doors. "Hanging up" was of a frequent occurrence. Even in the auxiliary storage hoppers, large pieces of coal coked slightly, and jammed together at the sloped part of the hopper. Rodding had to be employed frequently, choked ascension pipes were the order of the day, and systematic cleaning was essential. This was done twice per shift of eight hours, and oftener if necessary. We reverted to the water seal instead of the dry; and this helped not only the ascension pipes, but the hydraulic main as well. This seal is immediately on top of the retort offtake, and consists of a cup giving about 1 in. of water seal. It is maintained by a constant drip feed; any excess trickling-over into the inside of the offtake. This helped the ascension pipes a good deal.

The hydraulic main is ⊃ shaped, 18 ft. long, tapering from a depth of 27½ in. to 17 in. The depth of liquor is 15 in. at the flushing, or offtake, end, and 3½ in. at the shallow end. The first signs of choking were apparent when the cleaning rod could only be inserted about 2 in. into the main. The rod is Y shaped; and it was not possible to turn this round inside the main. Constant flushing of the main and cleaning-out of the heavier tars from the flushing end were tried, but did not assist materially in removing the deposit. The depth of liquor in the main was not capable of carrying the tarry matter to the flushing end. Before matters became worse, we decided to examine the hydraulic; and the simplest and most complete method was adopted. We stopped gas making on a Sunday morning, and detached the end plate of the main. We were thus able to see from end to end, and to discover the nature and amount of the deposit. This was found to be very considerable at the shallow end on the floor and walls of the main. In fact, the end was completely blocked, and there was barely 3 in. clear from the top of the main for about 6 ft. It was obvious that the tarry matter which had been cleaned from the ascension pipe had gradually built-up. The depth of liquor was not sufficient to carry it off. However, we managed to clean the main thoroughly; and within 3 hours of shutting-down we were gas-making again. This expedient was resorted to on three different occasions, and enabled us to assure ourselves that the interior of the main was in good condition.

Gas Yields.

Excellent yields of gas were had from the coking coals; 20,000 c.ft. of 400 B.Th.U. gas per ton being easily obtained. The coke was good, and was ideal for the producer, but the tar yield was considerably down—approximately 12 galls. to the ton, instead of the usual 17·5 galls. Saleable coke was also reduced to 4 cwt. per ton of coal carbonized, compared with 5·9 cwt.; but this was accounted for principally by the extra coke used for steam raising, and the large amount of breeze in the Silesian coke.

One difficulty when using coking coal was to keep down the quality of the gas. It was hardly possible to work with pressure on the top of the retorts and keep the quality normal, so that there was vacuum all the time. However, a jet photometer directly off the purifiers, and a Beasley calorimeter, enabled us to keep a fairly steady quality. Along with these precautions, the practice of scurfing at regular intervals, and of paying close attention to offtakes and seals, brought us through a time when coals and conditions were trying and abnormal.

Public Appreciation.

On the district there was at no time any cessation of supply or reduction of pressure. Demands for cooking, and, later on, heating, appliances were constant. In this respect it is an ill wind that blows nobody good. Consumers, prejudiced or otherwise against a cooker or a gas fire, having once enjoyed the comforts and privileges of the use of these appliances have now become converts, and in only two instances have we had cookers which were installed during the strike returned to us. Our public appreciated the services rendered, and our "complaint book" was not overburdened at any time.

Subsequently Mr. Laing, in reply to some questions, mentioned that in Brechin there was a good demand for coke by farmers, for greenhouses, &c., and by bakers.

Mr. Scott (Cowdenbeath) said that the Brechin Gas Company were to be congratulated on the manner in which they had handled a difficult situation. The coal strike had shown that the public could place reliance on the gas industry.

SOME POINTS REGARDING EDUCATION.

By John Duffy, of Dundee.

[Extract.]

Fair-minded educationists are of opinion that greater help should be afforded to those who, desirous and capable of a University education, are unable to fulfil their aims because of financial difficulties. The question has of late engaged the attention of those highly placed in educational circles; and no doubt a scheme of some kind will be thought out to meet the case. However, it is good to remember the many pioneers who, unable to enjoy a University education, turned their thoughts to account, and educated themselves, with extraordinary results.

How often have we heard the opinion given that a teacher is no good. The fault may be not with the teacher, but with the student alone. It is the duty of the teacher to awaken, strengthen, and regulate his student's mental faculties, so that each student under his care may exercise those faculties to the best purpose.

In the gas industry, good education depends on teachers of ability and practical experience, and on students prepared to study very seriously the subjects involved. Coupled with this, there should be willingness on the part of our chiefs to allow reasonable means for research work. Due to lack of enthusiasm, many of our young students have been content to rest at the most important part of their educational careers. Many educational schemes are surrounded by red tape. In our case, this must be removed, if our schemes are to be successful.

A FEW NOTES ON PUBLIC LIGHTING.

By John Ford, of Prestonpans.

In the Burgh of Prestonpans, up to the year 1920, gas was supplied to the street lamps, and charged for by having a few of the lamps in different parts of the district fitted with meters. By this means the average consumption of each lamp was determined. At that time a discount of 10 p.ct. off the standard price of gas was allowed. The Company had nothing whatever to do with the lamps beyond supplying the gas.

This arrangement was unsatisfactory both to the Town Council and to the Gas Company, because, owing to the lack of skilled attention, the lamps were kept in an inefficient state. From an advertising point of view this was detrimental to the best interests of the Company.

In 1920, therefore, an offer was made to the Town Council that the Gas Company should take over the whole responsibility for the street lighting at a fixed charge of 47s. per lamp per lighting season, for lamps with one No. 2 mantle. This price included the supplying of gas and mantles, and for painting, cleaning, lighting and extinguishing, and petty repairs—the lamps to be lit from one hour after sunset to 10.30 p.m. during a lighting season of six calendar months. The largest lighting unit at that time was one No. 2 mantle; and it was recommended that lamps with three No. 2 mantles be erected at all the more important positions in the town—a scheme to which the Town Council agreed. The charge for these lamps was 76s., under the same conditions as those previously mentioned.

Progress.

The taking-over of the street lighting by the Gas Company immediately resulted in a tremendous improvement in the general standard of the lighting, though, owing to the insufficiency of lamps, it still left much to be desired. In succeeding years more lamps were erected, and where it was deemed advisable old ones were taken down, and re-erected in better positions. Most of the lamps were fitted with burners of the three No. 1 mantle cluster type. Some of these alterations, though small, produced big effects.

The extent of these improvements was governed solely by the amount of money which the Town Council were prepared to spend on them; but, by taking things gradually, the standard of lighting was brought up to a fairly high pitch of perfection.

One suggested method to increase the efficiency of the lighting, at low initial cost, was to instal much larger units of light in the existing lamps; but owing to the rugged and uneven line of the buildings in most of the streets, this method was unsuitable. The whole of the previously mentioned improvements had, therefore, to be achieved by erecting more small lamps.

In laying new services, ¾-in. pipe was run to the bottom of the lamp column, with ½-in. pipe rising to the lantern, except in cases of comparatively long services, when 1-in. pipe was run—the slight extra cost of this pipe being a good investment for possible future developments.

Meeting Competition.

Slightly over a year ago the Lothians Electric Power Company made a strong attempt to get hold of the public lighting.

The price charged for the maintenance of the gas lamps at this period was, for lamps with one No. 2 mantle (of which there were still a few), 40s. each, and for lamps with three No. 1 mantles, 50s. each per lighting season. Ultimately the proposition was put forward to the Town Council that, if clockwork controllers were fitted to the lamps, at an initial cost of 30s. each, then the maintenance charge could be reduced to 35s. per lamp per lighting season of six months; the lamps being lighted from one hour after sunset to 10.45 p.m. This sum included the supplying of gas and mantles, winding the controllers, and cleaning and adjusting the lamps. This offer was at once accepted by the Town Council, on a three years' contract.

I may state that the price quoted for lighting the streets by electricity was 63s. per lamp per lighting season, for lamps giving an estimated illumination of 100 C.P. The candle-power of a cluster burner with three No. 1 mantles is, of course, much higher than this. Taking the candle-power of the burner as 170, then the comparative cost per candle-power, per season, is, for gas 2·47d., and for electricity 7·56d.

In deciding upon what type of clock controller to fit, both the gradual lighting type and the instantaneous lighting type were considered and tested; the latter being chosen for two reasons: First because the burner was much less liable to light-back with this type, and secondly because it could be much more accurately adjusted to light and extinguish at a given time. The number of times which the lamps failed to light due to an extinguished by-pass averaged one in every 137 lighting operations. The failures of the controllers themselves to light or extinguish averaged one in every 878 lighting and extinguishing operations; the principal cause of this being the evaporation or absorption of the lubricant on the controller stopcock plug. A little oil was all that was required to rectify this.

Comparison of the actual maintenance cost per lamp between hand lighting and automatic lighting is interesting:

Lamps with 3 No. 1 Mantle Cluster Burners.

—	Hand Lighting.		Automatic Lighting.	
	—	Cost.	—	Cost.
		s. d.		s. d.
Time lighting, &c.	12·3 hours	14 4·2	4·2 hours	4 10·8
Hours lit	1100	..	953	..
Gas consumed, c.ft.	6600	19 9·6	7100	21 3·6
Mantles used	11·5	3 1·4	10	2 8·5
Petty repairs	..	1 8	..	0 2·2
Total cost		38 11·2		29 1·1

The petty repairs during the time the lamps were lit by hand included the supplying and fitting of glass. This is not done under the new contract. Leaving out these items, therefore, there is shown a gross saving of fully 8s. 4d. per lamp. The many other advantages of automatic controllers, such as the better service given, due to the nearly simultaneous lighting of the lamps, are such as can hardly be measured in terms of money.

In conclusion, I think it is safe to assume, from the foregoing figures, that the advantages, economical and otherwise, are very much in favour of automatic lighting.

Mr. BROWN (Kirkcaldy) suggested that the figures given for mantle maintenance were high. In Kirkcaldy an average figure was 3 or 4 per annum.

Mr. FORD said these figures were for cluster burners. If considered in terms of nozzles, 3·3 mantles per annum would be the number.

Mr. GAVIN (Kirkcaldy) asked how often the lamp pillars were painted, and what paint was used. He understood that with cluster burners mantle breakages were reduced to a minimum; and he was surprised to learn that automatic lighting had not considerably reduced the number.

Mr. FORD replied that the pillars were painted once every two years with Hamilton's "Possilpark" ordinary green paint.

In reply to Mr. MACKIE, of Kelty, Mr. FORD said that they used principally the Horstmann clock controller. There were a few "Gunfire" controllers.

Mr. MORTON (Kinross) asked what effect the introduction of cluster burners had on the deflectors of lanterns.

Mr. FORD said that they had experienced some breakage of deflectors, but only slight.

Mr. FARQUHAR (Kennoway) said that in Fife most gas undertakings "exploited the moon." What was the practice at Prestonpans?

Mr. FORD replied that, three years ago, during the moon periods the lamps were left unlighted for about four nights per month; but since then the practice was to have them lighted continually.

Mr. MORTON inquired whether, since the contract was made on a basis of three years, there was any form of sliding-scale.

Mr. FORD said they had no sliding-scale. Some time ago their contracts did make an allowance according to price.

REMINISCENCES OF THE COAL STOPPAGE.

By A. NISBET, Jun., of Lochgelly.

When the stoppage occurred at the beginning of May, the Lochgelly Gas-Works was fairly fortunately placed as regards stocks of coal; and, with the subsequent purchase of bing coal at the colliery near the works, gas was made from local coal up to Aug. 21. Little difficulty was experienced during the period preceding this date; but, with the advent of foreign coal, troubles soon manifested themselves, and multiplied. The manufacturing plant consists of a setting of six Woodall-Duckham vertical retorts heated by two step-grate producers. Normally the average make per retort varies between 58,000 and 62,000 c.ft. per day. As the stock of coal at the works became depleted, and more of the bing coal was used, the make per retort diminished; and at the beginning of August it was only 40,000 c.ft. The bing coal had nearly 30 p.ct. of gum in it. This was riddled out for some time, but ultimately the riddling was discontinued and the coal taken up to the bunkers with the gum included. This necessitated extra attention at the top of the bench, rodding the retorts; and two men were employed from 6 p.m. to 6 a.m. in the retort house, instead of the one who normally did all the work during these hours. Gas was being made from the three retorts on one side of the bench heated by one producer; but, by the middle of August, owing to the reduced make per retort, the other producer was lit-up for the heating of the other side of the setting.

FOREIGN COAL.

The first consignment of foreign coal consisted of one lot of Silesian nuts and one lot of Lens "through and through." The Lens coal had more the appearance of shale than of coal, and the gas produced from this first consignment was of very poor quality indeed. Up till this time the retorts had been worked more or less on the continuous principle; but with this coal, which had no coking qualities, the extractors had to be stopped, and the retorts worked intermittently—the coke being drawn off at intervals.

The next consignment of foreign coal was a fairly large lot of Silesian nuts. This lot produced neither gas nor coke; and recourse was made to curtailing the supply of gas daily for eight hours during two weeks in September. The coal came through the retorts practically as it went in. In fact, a quantity was again taken up to the bunkers, and passed through the retorts a second time. As you will understand, the effect of the use of the residue from this coal (which was not coke) in the producers was soon felt, and the heats were lost in a short time. The producer fires were speared at the top of the step-grates, and cleaned out. It was found that they were filled with fine black dust, from the brickwork at the back to within 18 in. of the grate. This cleaning was continued once a week after this till local coal was again obtained. The production of tar at this time also dropped nearly 70 p.ct.; and considerable difficulty was experienced in keeping the offtake pipes clear at the top of the setting. Gas-making was suspended on the third Sunday of September, and the collecting main was opened. It was found to be pitched-up to within 1 in. of the offtake pipe outlets, leaving only the narrow valley through which the flushing liquor had maintained its course. This could not be completely cleared out in the one day, as the holder was nearly grounded; and it was four weeks later before gas-making could be again suspended, and the collecting main completely cleaned.

When Ostrauer coal arrived at the works, it was thought from its appearance that little improvement in conditions would take place; but it was an agreeable surprise to find this coal a beautiful coking coal and possessing splendid gas-making properties. Before the end of September a full supply of gas was again being given. An attempt was made to get more of this, but it could not be obtained; and gas-making was continued to the end of the stoppage on prime screened Silesian large coal, augmented in October by 20 p.ct. of home coal got from the local colliery, which by that time had some miners working. The prime Silesian screened coal was satisfactory for gas-making; and things again became gradually normal at the works. In November we were able to obtain 80 p.ct. of our requirements locally, as the number of miners working had increased.

Mr. L. LAING (Brechin), Mr. ROBERT GAVIN (Kirkcaldy), and Mr. J. KINCAID (Kirkcaldy) expressed appreciation of Mr. Nisbet's paper.

The PRESIDENT remarked that the Council's experiment in asking the younger men to give short papers had been successful. He then moved a vote of thanks to the authors, which was passed with acclamation.

Society of British Gas Industries.—The annual general meeting of the Society will be held at the Hotel Cecil, London, W.C., on Thursday, May 26—Viscount Ednam, M.C., D.L. (the President), in the chair. At 2.30 there will be the general business meeting, at which the report and accounts will be submitted and officers and Council elected; and at 3.30 the President will deliver his address, which will be followed by the induction of the new President. The dinner will take place in the Hotel at 7.30 in the evening.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

ANNUAL GENERAL MEETING.

Following the General Meeting, there was discussion on the paper which Mr. J. H. Goldsmith, of the South Suburban Gas Company, read at the meeting on March 25—see "JOURNAL" for March 30—but publication of which has been delayed for the discussion. This is a thesis which gained for the author the Diploma of the Institution of Gas Engineers, and it contains a wealth of information on the flow of gases through a horizontal retort setting.

The Annual General Business Meeting of the Association was held on Friday, May 6, at the Westminster Technical Institute, S.W.—Mr. Arthur Broadbent (the President) in the chair.

The Hon. Secretary (Mr. J. H. Goldsmith) read the minutes of the last annual general meeting.

Financial Statement.

The Hon. Treasurer (Mr. H. F. G. Soar) then submitted the financial statement. He mentioned that the session had witnessed an increase of three in the membership of the Association. The financial affairs were in a satisfactory state; and there was a small balance of profit on the year's working.

The balance-sheet was adopted, on the proposition of the President.

Report of the President.

The President then reported as follows on the working of the Association during the session:

It is a great pleasure to me to be able to report that your Council can again record a successful session. You have heard from the Hon. Treasurer that there is a small credit balance on the year's working, and that the Association continues to be in a healthy state financially.

The ordinary membership is the highest on record; being 313, compared with 310 subscribing members in the 1925-26 session. You will no doubt remember that at the last annual general meeting the rule setting out the necessary qualifications for admission to membership and associate membership was amended whereby an increase in qualification became necessary, which made it more nearly approach that required by kindred technical and scientific institutions. This was undoubtedly a step in the right direction, and it will certainly ensure that those admitted to membership are of the type desired by your Association.

The full programme of meetings and visits, as originally arranged, has been carried out without modification; and in this connection your Council were again fortunate in securing high-class lectures and papers, and in obtaining facilities for visits to important works, showrooms, &c. The sincere thanks of the Association are hereby extended to those gentlemen who have contributed papers or addresses during the session. The Council also take the opportunity of expressing their appreciation of the efforts of the Engineers and others who have so kindly entertained the Association on various visits during the session, and afforded such excellent facilities for acquiring greater knowledge of manufacturing processes, sales development, &c.

On March 4 the Association held its 25th Anniversary Celebration Dinner and Concert at the Criterion Restaurant. This was a great success; and our best thanks are due to those upon whom fell the work of organization. The importance of the occasion was indicated by the presence of an unusually large number of distinguished seniors, including Mr. John Wilkinson, the President of the Institution of Gas Engineers. A souvenir programme was issued on this occasion.

Your delegates during the session attended two meetings of the Joint Council, one at Manchester and one at Birmingham—the latter expressly for the consideration of ways and means whereby the Education Scheme of the Institution of Gas Engineers could be modified to make it more fruitful. On March 9 the Joint Council, by invitation, met the Advisory Committee of the Institution of Gas Engineers, at which meeting were discussed at some length the difficulties which had arisen, and which had seemingly been the cause of only a partial success of the scheme. I am pleased to be able to report that I believe good will result from this conference, and that we may look forward to seeing some special consideration given, in particular, to the case of the isolated student. The Junior Gas Associations throughout the Kingdom wish to see the Education Scheme of the Institution achieve the success it rightly deserves; and they will do all in their power to assist in this aim.

It is gratifying for the Association to be able to record that two members last year were successful in securing the coveted Diploma of the Institution of Gas Engineers—Mr. J. H. Goldsmith, of the South Suburban Gas Company; and Mr. S. H. Miles, of Reading. Your Council trust that the London and Southern Juniors will continue to provide a full quota of candidates under the Institution's Education Scheme, and that they may have the proud and pleasant duty of recording increasing successes year by year.

Close co-operation has been maintained with the Southern Association of Gas Engineers and Managers; your Secretary and myself having with profit attended their Council and general meetings.

Resignation of the Hon. Secretary.

The Council have with regret to inform the members of the resignation of the Hon. Secretary, Mr. J. Howard Goldsmith. You will recollect that Mr. Goldsmith took over the duties from Mr. Leonard Lacey on the latter's appointment as Junior Vice-President two years ago. The important duties devolving upon the Hon. Secretary have necessarily increased with the Association's growth, and now entail a tremendous amount of time and labour. These have been given unstintingly by Mr. Goldsmith; and our sincere thanks are due to him for the valuable services he has rendered to the Association in this important post.

We are indeed fortunate in having had as his understudy during these two years Mr. Arthur Tennant, of the Croydon Gas Company; and the Council are gratified to report that they have been able to prevail upon him to take over the Hon. Secretaryship. You can, without fear, place your utmost confidence in him, for he has the ability, tact, and energy to carry out these most important duties.

The Council are grateful to Mr. J. D. McSweeney, of the South Metropolitan Gas Company, for offering to undertake the duties of Assistant Hon. Secretary.

In conclusion, I desire to express my sincere thanks to the Secretaries and Hon. Treasurer in particular for the splendid work which they have accomplished, and to the officers and Council in general for their valued help and co-operation throughout the session. I trust that they and you will give the same generous support to my successor, Mr. Leonard Lacey, to whom I shall soon be handing-over the reins of office, in the full knowledge that he is well qualified in every way to fill the Presidential Chair.

Mr. T. H. Prater (Margate), remarking on the satisfactory nature of the President's report, said it was excellent that, in spite of the more stringent qualifications now necessary for membership of the Association, the number of members showed an increase. A further point to which he would draw attention was the good work of the Joint Council of the Junior Gas Associations in connection with the Education Scheme. They all realized that much remained to be done before the Education Scheme could be regarded as completely satisfactory; and the members of the Association owed their thanks to the President and to the other delegates for the work they had done in this respect. Mr. Broadbent's remarks about the Hon. Secretary and the Assistant Hon. Secretary were most acceptable to all the members.

Mr. A. G. Pavley (North Middlesex) also expressed the Association's appreciation of the President's report.

Mr. W. H. Cosh (South Metropolitan Gas Company) then moved a vote of thanks to the Officers and Council of the Association. The past session, he said, had been most valuable from the educational point of view. The industry at the present time was up against severe competition; and it was a source of satisfaction to the members to know that many of the problems with which they were faced were solved at the Association's meetings. He would include in the vote Mr. E. G. Merry, the Hon. Auditor.

The proposition was seconded by Mr. E. C. Le Jeune (South Metropolitan Gas Company); and Mr. G. Gardiner (Wandsworth) replied on behalf of the Council.

Presentations to the President and Hon. Secretary.

Mr. W. L. Westbrook (North Middlesex) said it was the custom to express their appreciation of the President's work by a testimonial. During his year of office Mr. Broadbent had led the Association with dignity and distinction. Mr. Westbrook moved that the illuminated address should be worded as follows:

London and Southern District Junior Gas Association.

Presented to Mr. Arthur Broadbent by the Council and Members of the London and Southern District Junior Gas Association, in order to record their high appreciation of the services rendered by him during his term of office as President for the session 1926-27.

His sound judgment has been of great benefit to the Association, and the thoroughness which has characterized his work, together with his long record of faithful allegiance to the Association, has earned for him the sincere respect of all.

We wish him good health and prosperity for the future.

Mr. Westbrook said that the Association also desired to express in tangible form their appreciation of the services of Mr. J. H. Goldsmith, their Hon. Secretary. The continued

progress of the Association was largely due to him; and it was their intention to present him with a pewter tea service.

Mr. W. T. KENSHOLE (Lea Bridge), seconding the proposition, said that the President had endeared himself to all the members of the Association. The speaker also referred to the excellent work of Mr. Goldsmith.

The PRESIDENT, in reply, remarked that his year of office had been a happy one. He had been supported by loyal Council and officers; and thanks were due to them.

Mr. GOLDSMITH also returned thanks for the Association's gift.

Mr. D. J. WINSLOW (Lea Bridge) moved a vote of thanks to the Westminster Technical Institute, and to Mr. J. Stuart Kerr, the Principal. He suggested that the Hon. Secretary should send him a letter of thanks.

This proposition was seconded by Mr. A. TENNANT, of Croydon.

The PRESIDENT remarked that Mr. Kerr was recovering from a severe illness; and he suggested that the Association's wishes for Mr. Kerr's speedy recovery to good health should be embodied in the letter of thanks.

This was agreed to unanimously.

NEW OFFICERS.

At this stage the election of the following office bearers for the next session was announced:

President—Mr. Leonard Lacey, B.Sc., Assoc.M.Inst.C.E., Gas Light and Coke Company.
Senior Vice-President—Mr. W. T. Kenshole, Lea Bridge District Gas Company.
Junior Vice-President—Mr. F. S. Larkin, Gas Light and Coke Company.
Hon. Secretary—Mr. A. Tennant, Croydon Gas Company.
Assistant Hon. Secretary—Mr. T. D. McSweeney, South Metropolitan Gas Company.
Hon. Treasurer—Mr. H. F. G. Soar, Gas Light and Coke Company.
Hon. Auditor—Mr. E. G. Merry, Gas Light and Coke Company.

A vote of thanks to the Press brought the first part of the meeting to a close.

Then ensued the discussion on the following paper, which was read at the meeting of the Association on March 25, and which gained for the author the Diploma of the Institution of Gas Engineers.

SOME POINTS IN THE DESIGN AND OPERATION OF HORIZONTAL RETORT SETTINGS.

By J. HOWARD GOLDSMITH of the South Suburban Gas Company.

In considering the lay-out of a new unit of retort settings, one can design the *tout ensemble* in conformity with modern ideas to give efficient working; but more often one is confronted with the task of remodelling an existing design to give better results. The author is not dealing with the relative merits of various materials for the construction of settings, but suggests a few points for consideration respecting their design and operation.

EXTERIOR OF SETTING.

The exterior part of a setting should be constructed with a view to minimizing the heat loss; and the following method is suggested for the construction of the main arches and top of bench, as shown in fig. 1. The main division walls should be 18 in. thick supporting semi-circular arches, which, in the opinion of the author, are desirable on account of their greater mechanical strength and lower end thrust as compared with segmental arches. The arches should be constructed of segmental blocks 9 in. thick, the first ones alternatively 12 in. and 18 in. long, with a 4½ in. reveal on the outer end for accommodating the front walls, as shown in fig. 2. Above the 9-in. arch is a 4½-in. course of firebricks, covered with a layer of insulating cement ½ in. thick, and then a course of insulating bricks of some suitable type. This combination of insulating cement and insulating bricks will be found to be a reasonably satisfactory method of heat conservation in the setting, without being too costly.

The lower portion of the spandril should be made of firebricks, while the upper portion can be filled-in with old hard bricks or old firebricks.

A course of "Flettons" or other suitable bricks forms the actual top of the bench; but on the top of this (as shown in fig. 1) a 3-in. air space is provided, covered with 2-in. tiles supported on bricks, right across the setting. This construction ensures comparative coolness on the top of the bench, and allows comfortable working conditions above the retort settings.

The front walls of the setting should be 14 in. thick, made up of a 9-in. wall inside, with a 4½-in. wall outside, separated by ½-in. thickness of insulating cement; the two walls being suitably tied together. Attention is drawn to the fact that soft insulating bricks should not be used on the front of settings, as they are not suitable for withstanding the heat and other adverse conditions.

When constructing the front walls of a setting (charging side and discharging side) it is very convenient if two small holes be left at the top of the setting, at a suitable position just under the main arch (fig. 3). There need only be an inch gap between two bricks, but it will always serve as an extremely useful guide to the working of the setting. Provision should also be made for the easy removal of a brick at these places, for ease of cleaning when necessary, and for safety when starting-up the bed after being shut-down.

PRODUCERS.

A producer to each setting lends itself to economical working, by the use of hot coke direct from the retorts and conservation of the heat in the producer gas. Another point in favour of the inter-built producer is that the setting then forms a complete unit on its own, and is not dependent upon an external source of heat, so that in the case of repairs, &c., to a producer, only one setting is affected.

It is easy when constructing a completely new retort house to allow sufficient depth in the producer; but more often than not one is faced with the difficulty of replacing an old producer with something better.

In an existing house the depth of the producer is determined by the stage floor and existing retort house machinery; but the height available may be better utilized by lowering the bottom of the producer—if this can be done without cutting into the foundations—and raising the bottom of the producer gas passage. The latter is often made unnecessarily large, as shown in fig. 4. Fig. 5 illustrates a producer with 2 ft. more effective depth than that in fig. 4, effected without altering the height of the nostril holes. The gas tunnel has to pass sufficient gas to supply the majority of the nostril holes. Therefore the effective area on the cross-section AA must be sufficient, allowing for accumulation of small coke, dust, &c., to pass this quantity of producer gas without increasing its velocity at this point.

GAS VELOCITY THROUGH PASSAGES.

Throughout the setting, attention should be paid to the velocity of the gases through the various passages and openings, to make sure that the greatest freedom of working is obtained with a minimum draught. Assuming the producer shown in fig. 5 makes 15,000 c.ft. of gas per hour, calculated at 15° C., as indicated in the appendix, this volume, at a temperature of 1000° C. before entering the combustion chamber, becomes 66,300 c.ft. per hour.

In the design illustrated in fig. 5, there are twelve nostril holes, so that the amount of producer gas required per nostril hole is 5525 c.ft. per hour. As two nostril holes obtain their

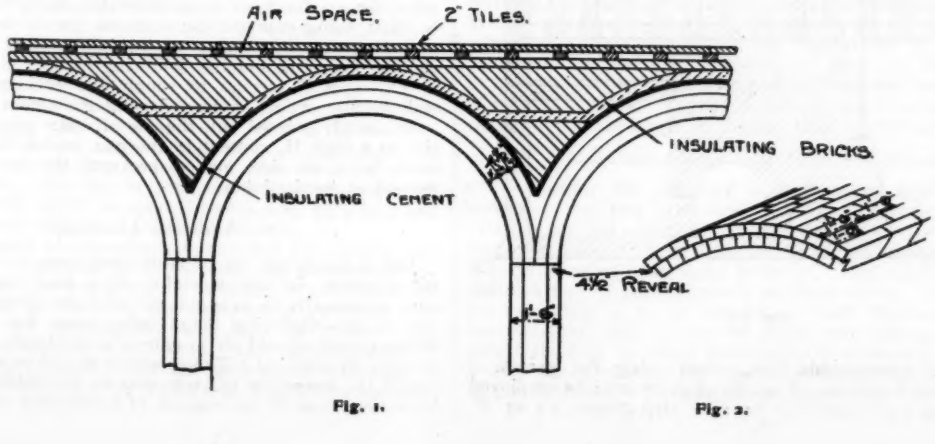


Fig. 1. Fig. 2.

gas direct from the producer, the amount passing AA is 55,250 c.ft. per hour.

The cross-sectional area of AA is: Semi-circular arch 2 ft. radius = 6·28 sq. ft. The velocity of the gas passing this

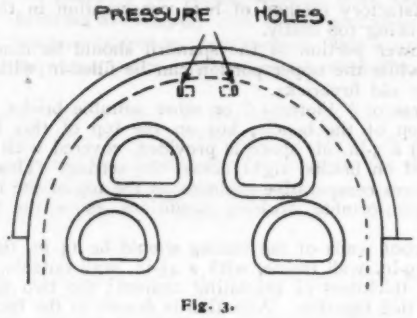


Fig. 3.

point is 2·4 ft. per second. Allowing for 6 in. of accumulated coke, dust, &c., on the bottom of the tunnel, the velocity will then be 3·6 ft. per second, which shows that the area allowed is ample, and that the size of tunnel as shown in fig. 4, is altogether unnecessary.

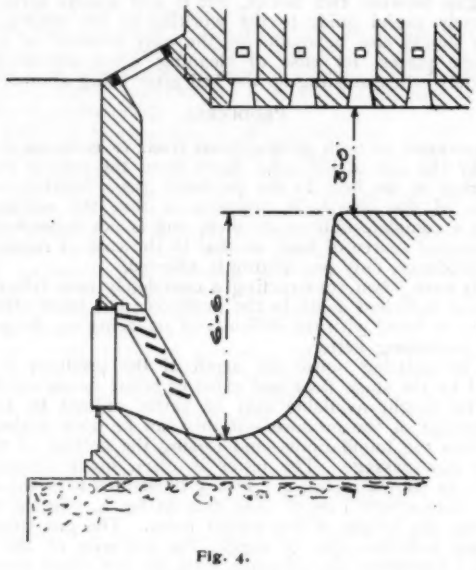


Fig. 4.

In the modified design, fig. 5, the front part of the producer is carried out a little further, to allow of easier firing-up. When alterations of this kind are made, a larger grate should be provided, if the old one is at all small, and, if possible, one of the modern clinker-preventing grates should be used to improve further the efficiency of the producer. The standard of grate area required for the size of setting is often unsatisfactorily given in text books as so much per linear foot run of retort. This is obviously misleading in many cases, as no account is taken of the size of the retort other than length. A better standard is to take the grate area in proportion to amount of coal carbonized, as this is the figure that really matters.

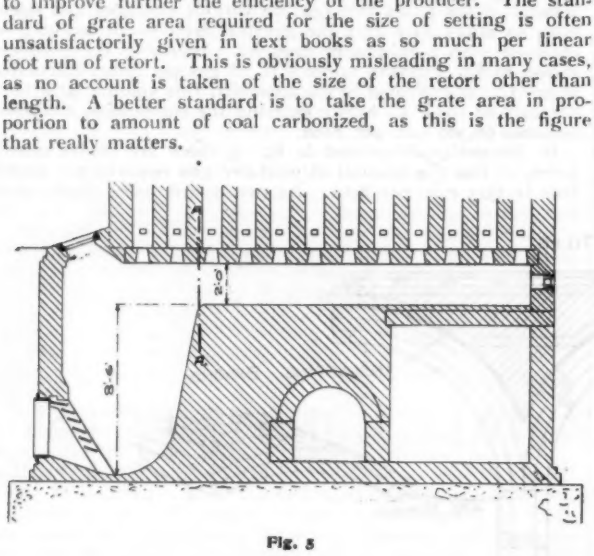


Fig. 5

The author recommends that, when using flat grates, a standard of not less than 1·8 sq. ft. of grate area be employed per ton of coal carbonized per day; for step grates, 1·4 sq. ft. per ton carbonized; and for the efficient modern non-clinkering grate, 1 sq. ft. per ton. These figures must be taken as an absolute minimum, and should be exceeded whenever possible.

Curtain walls, still to be found in old designs of producers, should be removed, as they are of no value when the producer is charged with hot coke containing no moisture and very little volatile matter, and lessens the available effective volume in the producer. The author has seen them so designed that the gas is prevented from passing through sufficient depth of fuel to promote a reasonable CO content in the gas.

GRATES.

The type of grate employed largely affects the working of the producer; and the following are the main considerations that should be ensured. The firebars should be inclined to promote a downward movement of the body of fuel as combustion takes place, and arranged to facilitate pricking-up, in order to maintain free access of air over the entire grate area. The grate must prevent the formation of large masses of clinker, and must be easy to ash out. The bars must have a long life, and be easy of removal and replacement.

There are several excellent designs of grates at the present time, but the author believes that the one shown in fig. 6 is among the best. Having had considerable experience in the control of retort settings fitted with this type of grate, he can testify to their efficient working, ease of control, and low maintenance cost. In this grate very long life is obtained for the firebars, only one or two new bars being required in a year's continuous working. Being curved, they are easily removed and replaced.

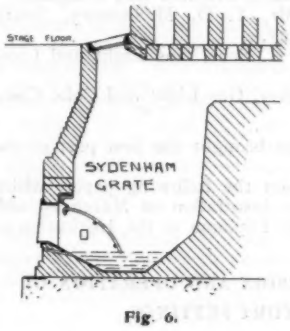


Fig. 6.

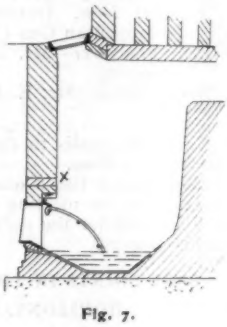


Fig. 7.

The use of water-sealed ashpans, together with water-cooled firebars, is, in the opinion of the author, essential for the economical working of the producer, but is not recommended by some authorities, as the water present gives rise to an uncontrollable amount of steam. The hot ash and clinker, when removed, or when they fall from the producer, must pass into the water of the ashpan, and so a large amount of heat is recovered which would otherwise be wasted. The hot ash produces steam when in contact with the water, and so obviates the necessity of any external steam supply, while at the same time the ash is cooled, thereby allowing easier working conditions for the firemen. When comparing the working results of two producers, one fitted with a water ashpan, and the other with an external steam supply, account must be taken of the steam to be supplied by external sources to the one, which, as indicated in the Appendix, will amount to 63·9 lbs. of steam per hour per setting. This would make a total of 1534 lbs. of steam per hour for a retort house of 24 settings, and should not be lost sight of when comparing results.

The steam passing through the producer is split-up into hydrogen and oxygen. Most of the hydrogen goes forward free, and the oxygen, combining with the carbon of the fuel, robs the producer of a considerable amount of heat. The reaction being endothermic prevents the formation of a high percentage of CO, owing to the temperature of the fuel becoming lowered, and the following exothermic reaction $2CO + O_2 = 2CO_2$ occurs to supply the necessary heat as the endothermic action of decomposing the steam takes place.

As already pointed out, the use of water in the ashpan gives rise to a high H_2 content in the gas, which to a large degree cools down the fire, and so prevents the formation of large masses of hard clinker.

AVOIDING CLINKER.

The arduous process of clinkering, once so common in the retort house, is very wasteful, as a large quantity of coke must necessarily be brought out with the clinker. The necessity of the clinkering doors being open for lengthy periods allows excess of cold air to enter the producer, and so partially to upset its working. The producer should be so designed as to curtail the formation of large masses of clinker, or prevent its formation, even at the expense of a reduction in the percentage

of CO in the producer gas. The other advantages considerably outweigh this disadvantage.

It is necessary that frequent pricking-up be given to the fire (every two or three hours) to assist the movement of the fuel. This pricking-up takes a few minutes with the type of grate shown in fig. 6, and, beyond ashing-out every four hours or so, is all that is required.

It is often stated that producers should not go longer than four hours without replenishing with fuel; but this makes a lot of unnecessary work. With comparatively deep producers, six hours is a suitable time between replenishing periods. This reduces the amount of labour entailed by 50 p.ct., and for 12-hour charge is a satisfactory period. When the settings are working with 10-hour charges, the firing-up or replenishing periods should be 5 hours apart, to fit in with the discharging times. Every time the producer is fired with fresh fuel, cold air is admitted which cools down the setting and disturbs the gaseous working; and for this reason alone the periods between refuelling should be as long as possible consistent with a reasonably uniform quality of producer gas.

In the design of a retort setting it is often more advisable to be guided by results found in practice than only theoretical ones; and this applies particularly to the producer. When dealing with a producer like that in fig. 7 it was found that, when it was worked at all hard, there was a tendency to form clinker at X. By modifying the design to that shown in fig. 6, all tendency to form clinker absolutely disappeared, giving just the required movement to the front of the body of fuel. The author suggests that the producer shown in fig. 6, with that particular grate, is probably the most practicable yet designed for retort settings.

Efficient Combustion of Producer Gas.

After the gas has been efficiently made in the producer, the question of efficient combustion with secondary air has to be considered. The usual practice is for the secondary air to meet the producer gas nearly at right angles, as indicated in fig. 8. This has a retarding effect upon the initial flame

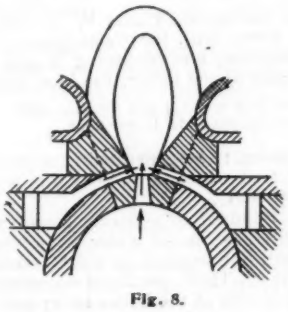


Fig. 8.

velocity, due to the nearly horizontal secondary air supply tending to form a barrier into which the producer gas has to force its way, and produces a short flame. This short, sharp flame is not desired; and the arrangement should be modified to permit as long a flame as possible to be generated, with, of course, a lower intensity of heat, and greater radiating power, giving more even heating to the combustion chamber. Fig. 9 shows a much better design of secondary air port, which may easily be adapted to any retort setting. The secondary air is directed into the combustion chamber at an angle nearer to the vertical, tending to converge as shown, and so have an ejector effect upon the producer gas, helping it in this case through the nostril holes, instead of hindering it, thereby promoting a higher flame velocity, with a resulting longer flame.

Nostril Holes and Secondary Air Ports.

Attention must also be given to the size of the nostril holes and secondary air ports, which should be made with larger openings at the bottom than at the top, so that any obstruction falling into the hole will tend to clear itself. With twelve nostril holes, as shown in fig. 5, the volume of producer gas at 1000° C. passing through each nostril is, as already stated, 5525 c.ft. per hour. The velocity of the producer gas and secondary air into the combustion chamber is found in practice to be very satisfactory when between 9 and 10 ft. per second. The size of the nostril hole can therefore be easily calculated, which is approximately 6 in. by 4 in.; and this gives an actual velocity of 9·3 ft. per second.

The total amount of secondary air required for combustion, as set out in the appendix, is 13,580 c.ft. per hour at 15° C. It is assumed that the secondary air is raised to a temperature of 950° C. prior to entering the combustion chamber, and the volume at this temperature will then be 57,600 c.ft., supplying the 24 secondary air ports. This is equivalent to 2400 c.ft. per hour passing through each port. The size of the secondary air ports can be calculated to give an air velocity corresponding to that of the gas through the nostril holes —*i.e.*, 9·3 ft. per second. This works out at approximately 3 in. by 3½ in.

The heating of the bottom retort is often found to be unsatisfactory, and can as a rule be traced to the fact that sufficient area of contact is not allowed under the retort to enable the necessary heat to be extracted from the waste gases. It must be remembered that by the time the products of combustion reach the bottom retort their temperature has been considerably reduced; and it will perhaps be necessary to allow some of the hotter gases from the combustion chamber to pass directly round the bottom retort, to ensure that sufficient heat is maintained at this point.

Regenerators.

The design of regenerators for heating-up the secondary air before it enters the combustion chamber calls for no little care and thought. Some designs provide an excellent heat transference but lack the facilities for cleaning and repairs, and thereby become worse than those less efficient to begin with, but which can be kept in their original state of efficiency. The method most commonly adopted is to pass the secondary air through channels next to the waste gases. This method must necessarily have a fairly low efficiency, because, as a rule, only part of the secondary air passage comes directly in contact with the waste gases. The advantage of this method is the freedom from complicated blocks or passages, and the relative ease of cleaning and repair when suitably designed.

It is necessary to make sure that the gases and air have as low a speed as is consistent with getting the longest travel of contact possible. Assuming the temperature of the secondary air at the top of the regenerator to be 850° C., then the total volume will expand from 13,580 c.ft. per hour at 15° C. to 52,900 c.ft. per hour when raised to the temperature of 850° C. From this it is obvious that, to maintain the same air velocity, it is necessary to increase the area at the top of the regenerator to 3·9 times that of the inlet openings.

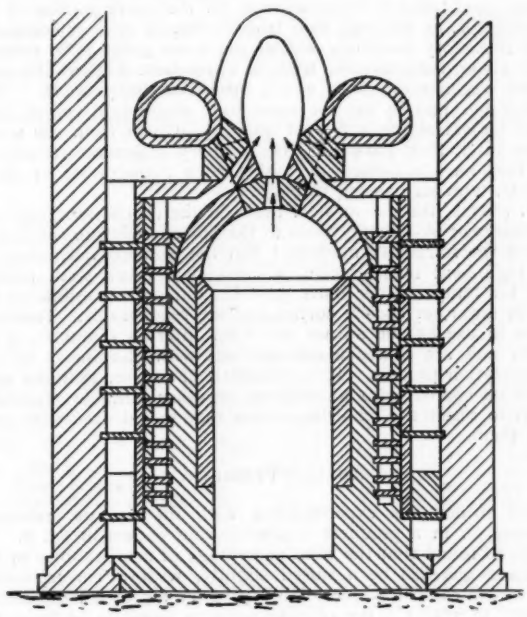


Fig. 9.

It has been seen that the secondary air nearly quadruples its volume in passing up through the regenerator; but the waste gases do not reduce their volume to one-quarter in coming down through the regenerator. The volume of waste gases, as shown in the appendix, is 26,230 c.ft. per hour at 15° C.; but with a temperature at the top of the regenerator of 950° C., the volume is 111,400 c.ft. Leaving at 650° C., the volume is 84,000 c.ft. It is therefore seen that, to ensure uniform velocity of the waste gases, this part of the regenerator must be approximately 1·3 times larger at the top than at the bottom.

Regenerator of the Author's Design.

The author has designed a regenerator embodying these features; and this is illustrated in figs. 9 and 10. When calculating the gas velocities through the regenerator, or through any other part of the setting, allowance must be made for any accumulation of dust likely to occur. The regenerator shown provides for an approximately uniform speed, with a velocity not exceeding 7½ ft. per second, for both the waste gases and the secondary air. It can be made very robust, and is comparatively easy to clean and repair if necessary. It ensures a long gas travel without any complicated blocks or methods of construction. The author suggests the use of specially-

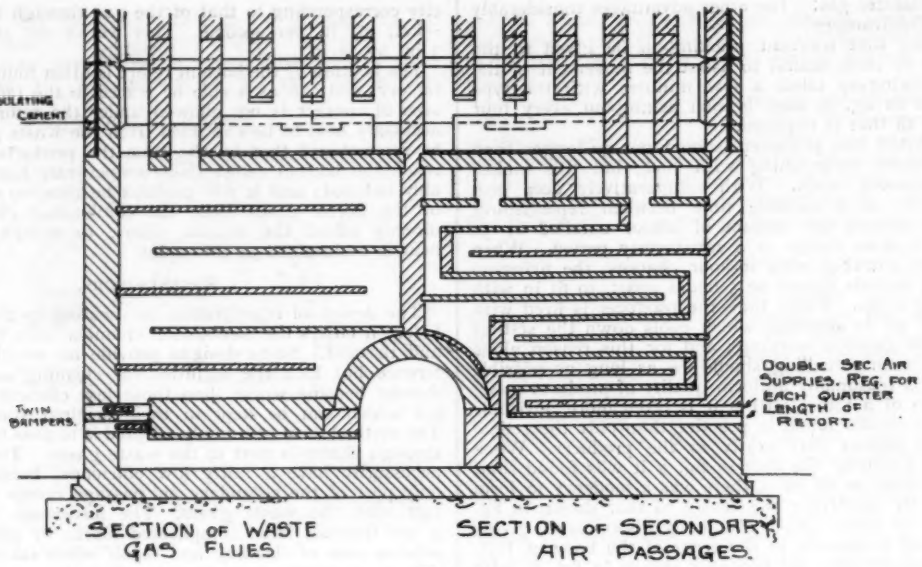

INSULATING CEMENT
TWIN DAMPERS.
DOUBLE SEC AIR SUPPLIES. REG. FOR EACH QUARTER LENGTH OF RETORT.
SECTION OF WASTE GAS FLUES
SECTION OF SECONDARY AIR PASSAGES.

Fig. 10.

coated steel tubes as being suitable for the lower portion of the regenerator, as the high heat transference of steel as compared with refractory materials enables the waste gases to be reduced to a lower temperature, with a consequent higher efficiency in the regenerator than would otherwise be possible. The author has had in use for some time aluminium coated steel tubes for extracting a further quantity of heat from the waste gases after they have left the ordinary regenerator, and so far they have satisfactorily withstood a temperature of about 500° C. with air passing through.

Of course, the use of steel tubes in the regenerator cuts-out the losses of by-passing liable to take place owing to the cracking of the refractory material; but the principal advantage is the high heat transference. Coated steel tubes seem unsuitable for temperatures above 900° C., but offer possibilities for use in lower, or cooler, portions of the regenerator. The steel tubes in use by the author are 6 in. internal diameter, ¼ in. thick, and are coated inside and out with aluminium by the metallization process. It is essential, of course, that the steel tubes be coated with aluminium or other suitable protective agent to resist the oxidizing action that would otherwise soon ruin them.

Preheated Primary Air.

The author has experimented with the use of preheated primary air in a producer similar to that shown in fig. 6. It has been found that the total percentage of combustibles in the producer gas has been raised slightly, with a corresponding rise in the calorific value. With primary air at a temperature of 270° to 275° C., the calorific value is found to be from 110 to 125 B.Th.U., as against 105 to 115 B.Th.U. with air at 15° C. The percentage of CO is reduced slightly, but the H_2 is considerably increased, while the CH_4 is frequently found to be as much as 2·6 to 2·8 p.ct., even just before firing up. The temperature at the top of the producer is about 50° C. lower when using hot primary air. The formation of clinker is further prevented by this lowering of the temperature of the producer.

Ordinarily no arduous labour is necessary with this type of grate, but it becomes even easier when using hot primary air. When admitting air at 275° C., it is apparent that considerable endothermic reactions are taking place, for it is assumed that the hot air passing over the water in the ashpan, and through the water-cooled firebars, produces a further quantity of steam, thereby forming the higher percentage of H_2, and so reducing the fuel temperature. The higher percentage of H_2 with the fuel at the lower temperature apparently facilitates the formation of CH_4 in larger quantities than would otherwise be formed. The fuel consumption of this setting has been reduced slightly, probably due to the less frequent necessity for pricking-up and ashing-out, which reduces the percentage of ashpan coke removed by these operations.

Waste-Heat Boilers.

The use of waste-heat boilers rather negatives the need for really efficient regenerators, as any heat lost by the setting can be recovered by the waste-heat boilers. It is sometimes economical to allow a larger quantity of heat to leave the settings, so that the boiler will provide a greater amount of steam that would otherwise have to be provided by some other boiler.

The heat available in the waste gases from one setting, for steam raising, can be calculated from the following formula:

$$H = W \times S \times 1{\cdot}8\,(T^\circ - t^\circ)$$

where H = the heat available in B.Th.U. per hour.
W = weight of products in lbs. per hour.
S = mean specific heat.
T and t are temperatures of gases, °C., before and after entering waste-heat boilers.

It is seen from the appendix that W = 2118 lbs. per hour, and S = 0·244. Then, with the waste gases at 650° C. after leaving the regenerator, and assuming a gas temperature of 230° C. at the outlet of the boiler, the heat available:

$$= 2118 \times 0{\cdot}244 \times 1{\cdot}8\,(650 - 230)$$
$$= 390{,}695 \text{ B.Th.U. per hour.}$$

Assuming the steam to be generated at a pressure of 120 lbs. per sq. in., from feed water at 85° C., this will give a steam temperature of 176·8° C.

The total heat required to generate steam at this pressure will be 1038 B.Th.U. per lb. of water evaporated. If the feed water is not heated, but supplied at 10° C., then the total heat required will be 1173 B.Th.U. per lb. of water evaporated, thereby reducing the capacity of the boiler by 13 p.ct.

The theoretical amount of steam capable of being raised from water at 85° C. will therefore be 390,695 ÷ 1038 = 376 lbs. per hour; or with a boiler efficiency of 70 p.ct. = 263 lbs. per hour. It is therefore seen that, under reasonable working conditions, the waste heat from one retort setting will evaporate 263 lbs. per hour at 120 lbs. per sq. in. gauge pressure.

263 ÷ 168·5 = 1·56 lbs. of water evaporated per lb. of coke used as fuel.

Considering a bench of 8 settings to one chimney fitted with a waste-heat boiler, then the available evaporative power will be 8 × 263 = 2104 lbs. of water at 85° C.

The efficient use of waste-heat boilers necessitates a fan to pull the products of combustion through the boiler and give the necessary vacuum on the retort settings. Against the heat recovered by the waste-heat boiler must be debited the power required to operate the fan, which is calculated below.

$$\text{H.P. required for compression (isothermal)} = \frac{144 \cdot P_1 \cdot V_1 \cdot \log_e R}{33{,}000}$$

Assuming inlet pressure of fan (P_1) to be 4 in. vacuum
= 0·144 lb. per sq. in.
= 14·556 lbs. per sq. in. Absolute.
Outlet pressure of fan (P_2) 1 in. pressure = 0·036 lb. per sq. in.
= 14·736 lbs. per sq. in. Absolute.
V = volume in c.ft. per minute. One setting generates (at 230° C.) 46,000 c.ft. per hour × 8 = 766 c.ft. per minute × 8 = 6128 c.ft. per minute.

$$R = \frac{P_2}{P_1} = \frac{14{\cdot}736}{14{\cdot}556}$$

$$\text{H.P.} \quad \frac{144 \times 14{\cdot}556 \times 6128 \times 2{\cdot}3 \log \frac{14{\cdot}736}{14{\cdot}556}}{33{,}000} = 4{\cdot}75 \text{ H.P.}$$

Allowing 60 p.ct. efficiency for the fan, the power required will be 8 H.P. If the fan be driven by a steam engine, then, with a consumption of 40 lbs. of steam per B.H.P.-hour, the steam required will be 320 lbs. per hour. This amount must be subtracted from the evaporative power of the boiler, giving 1784 lbs. of steam per hour available for use.

After the waste gases have left the boiler at a temperature of 230° C., there is still a large amount of heat left in them, and this can be conveniently used for feed water heating. When

the waste gases are cooled below 135° C., corrosion of the tubes of the feed water heater is liable to take place, due to SO_3, so that special provision must be made for coating the tubes with a protective agent, to ensure for them a reasonable life. For this reason it is advisable to place the fan between the boiler and the feed water heater, so that the fan is not liable to the corrosive action.

The desirability of feed water heating has previously been mentioned; but after this has been carried out, there is still an appreciable quantity of heat available in the waste gases which could be used for preheating the primary and secondary air supplies to the setting. The cost of the apparatus for recovering this extra heat, however, would preclude its use except in exceptional circumstances.

CONTROL OF DRAUGHT.

The draught on the settings should be controlled so that it is about level gauge in the combustion chamber; for if there is a vacuum at this point, any cracks in the retorts will allow leakage of coal gas into the setting. With level gauge in the combustion chamber, there will be a slight pressure at the top of the setting; and this can be observed by means of the two small holes in the front walls just under the main arch, as mentioned earlier in this paper (fig. 3). If a slight flame is visible from these holes, it is apparent that there is not excessive pull; and so immediate indication is given of the conditions in the setting. When starting-up a setting from cold, it is desirable to remove the brick next to these holes, to give a vent to the hot gases coming from the combustion chamber, which will indicate that the gases are filling the setting—a point that should be carefully noted before opening the dampers.

The control of retort settings to ensure satisfactory working is greatly facilitated if periodical testing of the gases be adopted to ensure that the most satisfactory results are maintained. It is, of course, essential that no CO goes forward into the waste gas flues. To obviate this, excess secondary air must be admitted, and with careful regulation should not exceed 7 p.ct., as shown in the appendix. This will give an analysis of the waste gases approximately: CO_2, 19·5; O_2, 0·7; and N_2, 79·8 p.ct. by volume.

The sampling of gases from a setting requires consideration and care. Attention was directed to this matter in a paper given by the author before this Association on Dec. 19, 1924 [see "JOURNAL," Vol. 168, p. 847].

APPENDIX.

It is essential to know the volumes of the gases passing through the setting, so that the gas passages may be suitably designed to give the best results. These calculations are based upon practical working conditions for a setting of 10 retorts, 22 ft. long, and have been taken as representative of the type of horizontal setting now largely used.

The fuel consumption is taken at 150 lbs. of carbon per hour used in the producer. This represents about 13 p.ct. of the weight of coal carbonized, with the coke containing 11 p.ct. of ash.

The analysis of the producer gas (by volume) is:

	P.Ct.
CO_2	8·2
CO	23·2
H_2	8·0
CH_4	0·8
N_2	59·8
	100·0

The actual calorific value is 110 B.Th.U. (gross).

This is taken by the author as being a fair average result obtained under working conditions from producers having water-cooled fire-bars and water-sealed ashpans.

The effect of steam and air upon the body of carbon in the producer causes the following reactions to take place.

With air the oxygen combines with the carbon, and liberates nitrogen:

(1) $C + O_2 \rightarrow CO_2$ exothermic reaction
(2) $C + CO_2 \rightleftarrows 2CO$ reversible " {endothermic / exothermic
(3) $2C + O_2 \rightarrow 2CO$ exothermic "
(4) $2CO + O_2 \rightarrow 2CO_2$ " "

The steam acts upon the carbon as follows:

(5) $C + H_2O \rightarrow CO + H_2$ endothermic reaction
(6) $C + 2H_2O \rightarrow CO_2 + 2H_2$ " "

Steam in contact with any CO already formed is liable to the reversible reaction:

(7) $H_2O + CO \rightleftarrows H_2 + CO_2$ {exothermic / endothermic

Hydrogen liberated by reactions 5, 6, or 7 may produce methane according to the following exothermic reactions:

(8) $C + 2H_2 \rightarrow CH_4$
(9) $CO + 3H_2 \rightarrow CH_4 + H_2O$
(10) $CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$

It is seen that the carbon consumed is converted to CO_2, CO, or CH_4; but as the amount of carbon used for making CH_4 is very small, this amount is neglected for simplifying the following calculations:

1 lb. of C + 2·66 lbs. of O_2 gives 3·66 lbs. of CO_2 = 31·4 c.ft.
1 lb. of C + 1·33 lbs. of O_2 gives 2·33 lbs. of CO = 31·4 "

Therefore the carbon is consumed proportionately to the percentages of CO_2 and CO present in the producer gas. Thus 39·2 lbs. of carbon is consumed to form CO_2 and 110·8 lbs. of carbon to form CO. Knowing the analysis of the producer gas, its volume can be easily calculated.

39·2 lbs. of C × 31·4 =	1,230 c.ft.	CO_2 = 8·2 p.ct. (volume) =		143·5 lbs.
110·8 " C × 31·4 =	3,480 "	CO = 23·2 " " =		258·3 "
By proportion	1,200 "	H_2 = 8·0 " " =		6·4 "
" "	120 "	CH_4 = 0·8 " " =		5·1 "
" "	8,970 "	N_2 = 59·8 " " =		666·9 "
Total producer gas = 15,000 c.ft. per hour			=	1080·2 "

The amount of primary air admitted is worked out from the amount of nitrogen present in the producer gas. Allowing the composition of the air to be (by volume) 20·4 p.ct. oxygen and 79·6 p.ct. nitrogen, then the amount of air giving 8970 c.ft. of nitrogen is 11,270 c.ft. per hour, containing 2300 c.ft. of oxygen.

In the formation of CO_2, the oxygen, in combination with the carbon, produces its own volume of CO_2, and in forming CO twice its own volume. Therefore the oxygen used to form 1230 c.ft. of CO_2 in the producer gas is 1230 c.ft. To form 3480 c.ft. of CO, it requires 1740 c.ft. of O_2, making a total of 2970 c.ft. of oxygen used in the formation of the producer gas. As 2300 c.ft. of this O_2 is obtained from the primary air admitted, the remaining 670 c.ft. is supplied by the steam when split-up in passing through the fuel.

Steam when decomposed forms its own volume of hydrogen and half its volume of oxygen; the volume of steam used is therefore 1340 c.ft. per hour = 63·9 lbs.

It is seen that from the steam used, 1340 c.ft. of hydrogen is liberated. In the producer gas only 1200 c.ft. of H_2 is present; the difference being due to the formation of CH_4.

The amount of secondary air required for the combustion of the producer gas is calculated below.

1 lb. of CO requires 0·573 lb. of O_2.	Then 258·3 × 0·573 =	148	lbs. O_2
1 " H_2 " 7·94 lbs. " O_2.	" 6·4 × 7·94 =	50·8	" O_2
1 " CH_4 " 3·99 " O_2.	" 5·1 × 3·99 =	20·3	" O_2
Total oxygen required (per hour) . .		219·1	lbs.

To ensure complete combustion at all times, excess of oxygen is admitted. Adding 7 p.ct., the total oxygen becomes 234·4 lbs. = 2770 c.ft., making 13,580 c.ft. of air per hour.

The amount of N_2 is 10,810 c.ft. = 803·7 lbs. The 7 p.ct. excess of O_2 = 15·3 lbs. = 180 c.ft.

The volume of the products of combustion can now be found.

Producer Gas: Secondary Air.

CO_2 . 143·5 lbs.	143·5 lbs.	CO_2 =	1,230 c.ft.	CO_2
CO . 258·3 " + 148·0 lbs.	O_2 =	406·3 "	CO_2 =	3,480 "	CO_2
H_2 . 6·4 " + 50·8 "	O_2 =	57·2 "	H_2O =	1,200 "	H_2O
CH_4 . 5·1 " + 20·3 "	O_2 =	14·0 "	CO_2 =	120 "	CO_2
		11·4 "	H_2O =	240 "	H_2O
N_2 . 666·9 "		666·9 "	N_2 =	8,970 "	N_2
Excess oxygen		15·3 "	O_2 =	180 "	O_2
Nitrogen from secondary air .		803·7 "	N_2 =	10,810 "	N_2

—	Lbs.	P.Ct. Weight.	C.Ft.	P.Ct. Volume.	P.Ct. Volume, *less* H_2O.
The total CO_2 .	563·8	26·6	= 4,830	18·4	19·5
" " O_2 .	15·3	0·7	= 180	0·7	0·7
" " N_2 .	1470·6	69·5	= 19,780	75·4	79·8
" " H_2O .	68·6	3·2	= 1,440	5·5	..
	2118·3	100·0	= 26,230	100·0	100·0

The volume of the products of combustion = 26,230 c.ft. per hour.

The mean specific heat of the waste gases may be found as follows, taking the specific heat (constant pressure) of CO_2 = 0·216, O_2 = 0·218, N_2 = 0·244, and H_2O = 0·480.

0·266 × 0·216	= 0·0574
0·007 × 0·218	= 0·0015
0·695 × 0·244	= 0·1696
0·032 × 0·480	= 0·0154
Mean specific heat	= 0·2439

The foregoing calculations give the volumes of the gases in c.ft. per hour at a temperature of 15° C. and at 760 mm. The volumes expand according to the Absolute temperature (Charles' Law); and below are appended the volumes of the gases at the temperatures operating in the setting, to enable calculation of their velocities to be accurately obtained.

Producer gas at 15° C.	=	15,000 c.ft. per hour
" 1000° C. $\frac{15,000 \times 1273}{288}$.	=	66,300 " "
Primary air at 15° C.	=	11,270 " "
Secondary air at 15° C.	=	13,580 " "
" 850° C.	=	52,900 " "
" 950° C.	=	57,600 " "
Waste gases at 15° C.	=	26,230 " "
" 230° C.	=	46,000 " "
" 650° C.	=	84,000 " "
" 950° C.	=	111,400 " "

The preceding calculations are all based upon the following volumes per unit weight of gas:

CO_2	. . . .	8·57 c.ft.	per lb. at	15° C.	and	760 mm.	
CO	. . . .	13·47	,,	,,	,,	,,	,, ,,
H_2O	. . . .	20·97	,,	,,	,,	,,	,, ,,
H_2	. . . .	188·7	,,	,,	,,	,,	,, ,,
CH_4	. . . .	23·6	,,	,,	,,	,,	,, ,,
O_2	. . . .	11·8	,,	,,	,,	,,	,, ,,
N_2	. . . .	13·45	,,	,,	,,	,,	,, ,,

Discussion.

Mr. LEONARD LACEY remarked that it ill behoved the members of the Association to criticize a thesis which had gained for the author the Diploma of the Institution of Gas Engineers. They fully appreciated the paper, to which they would find it most useful to refer. The appendix in particular was worthy of considerable study. He heartily recommended it to anyone who was concerning himself with the problems of waste-heat boilers. On the evening on which the paper was read—*i.e.*, on March 25—had time permitted, they might have had an interesting debate on the advantages and disadvantages of horizontals and verticals; for Mr. Goldsmith had made out a good case for the former, and Mr. J. H. Miles, of Reading, had pointed to the virtues of verticals. Mr. Goldsmith had introduced some novel features into his paper. One which interested him (the speaker) was the regenerator of the author's design. Mr. Goldsmith appeared to favour the bar grate. He (the speaker) had not yet found a grate better than the step pattern. Mr. Goldsmith had also referred to curtain walls in producers. As far as horizontal settings were concerned, curtain walls were not in most cases a success. Mr. Lacey said that he had compared a producer with a curtain wall with one without; and he found no additional benefit with the former.

Mr. GOLDSMITH said he was not an advocate of horizontals, to the exclusion of other types of retorts; but as he happened to be at a works where horizontals were in use, he had naturally looked round to find out what could be done to improve their working. As for the regenerator of his design, this allowed a uniform speed of travel of the gases; in other respects it was of a type frequently used. He had found the grate mentioned in the paper a great improvement over the step grate. Curtain walls were useful for large and deep producers, but they detracted from the available volume in the case of the interbuilt producer. In the case of (say) a deep producer in connection with inclines, then a curtain wall helped to maintain a gas of constant composition.

INTERBUILT AND OUTSIDE PRODUCERS.

Mr. W. T. KENSHOLE (Lea Bridge) thought that the interbuilt producer was preferable for horizontal settings, provided, of course, that it was well designed. This type of producer, fed with hot coke from the retorts, gave a very good efficiency—about 75 or 80 p.ct. Under certain conditions, particularly when cheap slack was available—as had been pointed out some time ago in a paper by Mr. W. M. Carr, of Stretford—outside producers could be worked economically, though the efficiency might be as much as 15 p.ct. lower than that of the interbuilt producer. In connection with producers, the author had not mentioned one point—the feeding door. He (the speaker) had seen an otherwise excellent producer spoiled by the position of the feeding door, which was fitted at such an angle that it was difficult to feed-in the hot coke efficiently. He had experience of the bar grate and the step grate, though the latter was in a vertical setting, and consequently the conditions might be somewhat different from those obtaining in a horizontal unit. At one time it was the practice to draw-out the clinker from the bottom three or four plates of the step grate producer. They then tried the method of withdrawing the clinker from the bottom two plates only; all the clinker on the top plates being pushed into the fire. Tests of the amount of unburnt fuel withdrawn with the clinker in each case had shown that the quantity of unburnt fuel withdrawn by the latter method was less than by the former; and they had consequently adopted the system of withdrawing the clinker from the bottom two plates as their standard practice. Mr. Goldsmith had tackled the problem of gas velocities through passages in a most thorough manner; and he was to be congratulated on his work in this respect. The author suggested the use of specially-coated steel tubes as being suitable for the lower portion of the regenerator. Had Mr. Goldsmith any of these tubes working; and, if so, could he indicate their life? With verticals, continued Mr. Kenshole, they now worked without clinkering doors on the producers; and this, by allowing a more uniform distribution of air over the fire, gave better results.

Mr. GOLDSMITH agreed with Mr. Kenshole that a badly positioned feeding door detracted from the efficiency of any producer. As he had mentioned in his paper, in the modified design of producer the front part was carried out a little farther, to allow of easier firing-up. With regard to Mr. Kenshole's system of removing the clinker from the bottom two plates only of a step grate, he seemed to be effecting a compromise between the step grate and the bar grate. Why not instal a bar grate? The steel regenerator tubes had been in use now for between fifteen and eighteen months, and as yet had shown no signs of undue wear. They were steel tubes coated with aluminium, and were subject to temperatures not exceeding about 900° C. He did not favour the idea of having no doors to the producer. Without doors, regulation of primary air could only be effected by damping-back.

THICKNESS OF FRONT WALL.

Mr. T. D. MCSWEENEY (South Metropolitan Gas Company) asked Mr. Goldsmith what was his objection to insulating bricks on the front wall of a horizontal setting. He (the speaker) considered that the front wall of the author's setting was too thick—a 9 in. wall was sufficient. Regarding the author's regenerator, it appeared that difficulty would be experienced in cleaning the secondary air passages. He referred particularly to the two centre ones. As for the design of the producer, he considered that the gathering-over of the front wall might be a source of weakness. He agreed, of course, that settings should be designed to allow of streamline flow of the gases; but simplicity was of great importance.

Mr. GOLDSMITH, replying to the point about insulating bricks on the front of the setting, said that often a De Brouwer trough was fitted on the discharging stage. The stokers did not invariably show fine accuracy in directing the quenching water on to the hot coke. Some of the water was often played on to the setting; and the soft insulating bricks did not withstand the strain well. Moreover, if a cavity wall was required, the outside wall had to be bonded to the inside; and if the former was of soft insulating brick, the structure could not be as strong as if hard firebrick were used throughout. It was a matter of opinion whether a 14 in. wall was too thick. With a machine-operated setting, strain had to be taken up by the front walls during the discharge of coke; for any hanging-up tended to take place a short distance from the retort doors. This, he thought, justified a 14 in. wall. Moreover, such a thickness allowed of the interposition of insulating cement. The cleaning of the secondary air passages in the regenerator was not so difficult as Mr. McSweeney supposed. The wall was so constructed that a brick could be taken out for cleaning the first quarter, and by taking-out a brick from the inner wall, the inner passages could be cleaned. As a matter of fact, the secondary air passages needed little attention, for the main deposit was at the first bend, where it was easy to clean out. Regarding the convex surface of the front wall of the producer, this appeared to give a better flow to the fuel, and prevented the formation of clinker.

Mr. E. R. WILLIS (Gas Light and Coke Company) thought that, if the secondary air entered the setting at a temperature of 950° C., then Mr. Goldsmith's figure for the average temperature of the regenerator was high. The author had mentioned that often the bottom retorts in the setting did not get sufficient heat. To remedy this, his system was to by-pass the hot gases. To his (the speaker's) mind, this would result in a loss of efficiency, and it would be difficult to control the pull on the producer. Could the author give them the cost of the steel tubes?

Mr. GOLDSMITH, replying to the first point raised by Mr. Willis, thought that a figure of 850° C. was a reasonable one to take for working-out the size of a regenerator. As for the cost of the steel tubes, he could not tell as yet whether this would be prohibitive. It depended on their life and efficiency in relation to fireclay tubes.

The PRESIDENT thanked Mr. Goldsmith for his paper; and this terminated the meeting.

Caulking Stresses in Cast-Iron Pipe Sockets.

During 1926 an investigation into the stresses in cast-iron pipe sockets due to caulking was completed by the National Physical Laboratory. Two types of socket for 25-in. diameter pipes were used for the experiments; one conforming to the British Engineering Standards Association standard, the other of lighter design. Experiments were made with the sockets caulked by hand and with a pneumatic tool. Both run lead and lead wool were employed. The main conclusions were as follows: (1) The caulking stresses in the light type of socket were higher than those in the "B.E.S.A." socket with all types of joint tested. (2) In no case were the sockets broken due to caulking, though the stress in the light socket was estimated at 4·6 tons per sq. in. (3) There is a reduction in stress with time after caulking in the case of all the methods of caulking employed. The stress, however, becomes approximately constant after from seven to ten days. (4) The stresses in the sockets due to caulking with lead wool were higher than when run lead was employed. (5) The stresses in the sockets caulked by hand were higher than those due to machine caulking. (6) Satisfactory joints were formed using run lead and machine caulking—*i.e.*, the conditions giving the lowest stresses in the sockets.

Mercury in Coal Tar.

It was pointed out recently in a paragraph appearing in "Chemistry and Industry" that Dr. F. W. Aston had contributed a letter to "Nature" in which he dealt with the isotopic constitution of mercury derived from coal tar. Mr. W. Kirby, of the South Metropolitan Gas Company, had furnished a sample of the mercury, which appeared in the lightest of the fractions distilled, and occurred to the extent of about one part in seven millions of undistilled tar. Dr. Aston obtained a number of mass spectra, in which the groups of isotopic lines were indistinguishable from those of ordinary mercury. "Free Carbon" has since written to "Chemistry and Industry" the following comments: The amount found by Mr. Kirby corresponds very closely to the concentration found in a tar tank dealt with recently. This is not altogether surprising, as the tank contained 7 tons of tar, and the mercury which entered from a broken thermometer weighed approximately 1 gramme. This gives a result tolerably close to one part in seven millions. It does not appear at all strange that Dr. Aston found that the groups of isotopic lines were indistinguishable from those of ordinary mercury. Thermometers inserted in gas, liquor, and tar mains sometimes break. The bulb and mercury find their way into the pipe.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The Manchester Juniors visited the works of Messrs. C. & W. Walker, Ltd., at Donnington, near Wellington, Shropshire, on May 4.

Previous to inspecting the works the party were entertained at lunch by Messrs. Walker at the Victoria Hotel, Newport.

Mr. BATTERSBY, the President, expressed thanks to Messrs. Walker for the privilege extended to them of visiting their works, and at the same time took the opportunity of congratulating them on having received the order for certain plant for the new Johannesburg Gas-Works.

Mr. R. J. MILBOURNE, Managing Director of Messrs. C. & W. Walker, Ltd., extended a cordial welcome to the visitors. They would have an opportunity of inspecting a large gas-holder—the largest spiral-guided holder in a steel tank ever erected. They would also have an opportunity of seeing some purifiers of unusual construction, inasmuch as they were of more than ordinary depth. Many of the members, he thought, during their apprenticeship would not have to do with any large extensions with the particular company with which they were associated, and therefore would appreciate a visit to works where plant was in course of manufacture. It seemed to him that the daily Press took every opportunity of belittling the gas industry. A few consumers in some districts had evidently very short memories, and accordingly rushed letters to the Press complaining about the increased size of their gas accounts; they soon forgot that the gas industry carried them through the very difficult period occasioned by the coal strike, and that they were able to go to the gas fire and the gas cooker when they could not go to the coal cellar. Another point which he would mention, and which was exercising the mind of the gas industry to-day, was the question of amalgamations. This required very careful consideration. He thought that already there were examples where the big electrical super-stations were unable to cope as economically with the production of electricity as were some of the smaller stations; and possibly the same conditions might occur with regard to the amalgamation of gas undertakings. He was sure, however, that in many instances it would be an advantage for the smaller undertakings to be absorbed by the large ones.

PRESIDENTIAL BADGE.

Mr. J. ALSOP said that some time ago Mr. Fairhurst sent him a cheque for £2 2s., along with his resignation. The money had been spent in purchasing a badge to be worn by the President during his term of office. Mr. Alsop then presented this badge to Mr. Battersby.

The party then left for Donnington.

THE DONNINGTON WORKS OF MESSRS. C. & W. WALKER, LTD.

Practically every gas engineer and manager throughout the world, and a large majority of the colliery, coke oven, and chemical works managers in the United Kingdom, know the name of C. & W. Walker, Ltd., of the Midland Ironworks, Donnington. The firm, which consisted of two brothers, Charles and William Walker, originally carried on business in Clerkenwell, making valves and other small appliances for gas-works. They commenced operations at Donnington about the year 1864. At first only a score or two workmen were employed, but the business has expanded to such an extent that several hundreds now find constant occupation, while the technical staff, draughtsmen, and clerks, &c., bring the number of employees to nearly 700. The village of Donnington and many of the neighbouring villages practically owe their existence to the continued prosperity of the firm of C. & W. Walker, Ltd.

The works are connected by sidings with the L.M. & S. and Great Western Railways, while the Shropshire Union Canal provides an alternative means of conveyance. With respect to the raw materials and fuel used in the vast operations carried on, both are easy of access in the Lilleshall and Staffordshire districts, in the immediate neighbourhood of Donnington.

When first established, Mr. Charles Clement Walker supervised the works at Donnington, and Mr. William Thomas Walker devoted his attention to the management and development of the firm's interests in London, on the Continent, and, indeed, throughout the world. On the decease of Mr. W. T. Walker in 1892, Mr. C. C. Walker carried on the business alone for several years. After his death, the business was disposed of to a limited company, in May, 1899.

Mr. R. J. Milbourne, Assoc.M.Inst.C.E., F.C.S., is the Managing Director, and the works at Donnington are under the control of Mr. G. F. Handel Beard as General Manager. The extensive business of the Company in and around London is under the management of Mr. S. Moore Milbourne, A.M.I.Struct.E.

EARLY WORK OF THE COMPANY.

In the early days of the firm, the operations were largely of a general engineering character; and it was not until the building of the Beckton Gas-Works was commenced by the Chartered Gas Company (now the Gas Light and Coke Company), about the year 1869, that the firm came into prominence as manufacturers specially of gas-works plant. The firm was entrusted with a considerable amount of other work in the construction of what was then, and still remains, the largest gas-works in the world.

All the original purifiers at Beckton (which have long since been replaced by larger ones) were built by C. & W. Walker, who had for nearly thirty years a monopoly of the erection of purifiers at Beckton, having secured every contract against all competition during that period. Indeed, more than 120 purifiers had been erected there by the firm before any other manufacturer was successful in obtaining a contract. From this time, the design and manufacture of condensing, scrubbing, washing, and purifying plant, together with the construction and erection of large gasholders, became the principal business of the firm.

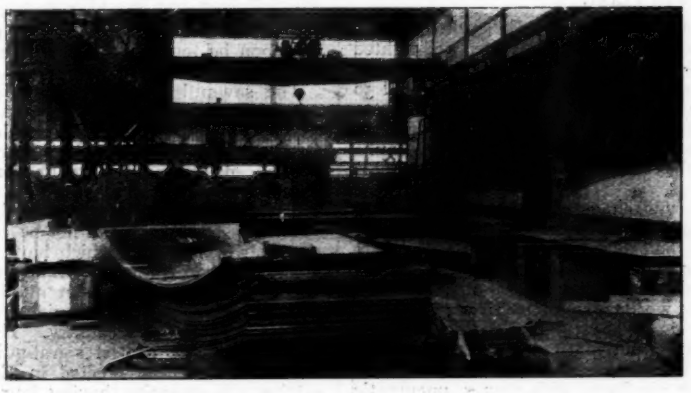


FIG. 1.—A PORTION OF THE TANK AND PLATE SHOP.

The chemistry of gas purification, &c., was studied, and the apparatus designed accordingly, with such effect that the firm's plant was adopted all over the world. Their name became famous not only in the Continent of Europe, but in both hemispheres, "from China to Peru," in the most literal acceptance of the phrase; and gasholders and other plant manufactured at Donnington are now in active operation at Tokio, Kobe, Osaka, &c., in the East, and Valparaiso, Santiago, Buenos Ayres, and other places in the opposite hemisphere. The firm have constructed gasholders and other plant in nearly all the principal towns of North and South Africa; the contracts in many cases having been secured in competition with foreign firms.

It is impossible in the limited space at our disposal to enumerate fully the many varieties of work turned out at the Midland Ironworks. In addition to gasholders, and washing and purifying plant, already mentioned, constructional iron and steel work of every description, including roofs, viaducts, girders, bridge work, pit head gears, oil tanks, coke hoppers, elevators and conveyors, steel buildings, well cylinders, riveted tubes, overhead water tanks, &c., are being constantly sent out from Donnington to all parts of the world.

EFFICIENT PLANT AND MACHINERY.

The works are divided into large erecting shops, fitting, boiler, and pattern shops, sawmills, wood-working shops, and foundry—all of which are fitted with modern steam, hydraulic, pneumatic, and electrical machinery. The shops are all closed in; and the physical comfort of the workers in the winter has been studied by the provision of a system of steam heating.

FIG. 2.—VIEW IN THE ERECTING SHOP.

The boiler and gasholder shops are most extensive, and some of the latest types of modern machinery may be seen there.

In the principal shop are motor driven flange, angle, and joist drilling machines; bevel cropper for cutting angles, tees, rounds, and flats to a bevel, or square; notching machine for joists, tees, &c.; horizontal and vertical hack saws; automatic gravity saw; emery facing machine for facing the ends of tees, joists, &c.; bar setting machines for straightening or setting bars; hydraulic flange presses; furnaces; hydraulic forging and pressing machines; bending machines; forges; and a bewildering variety of other tools. In the smithy are five steam hammers, two of 10 cwt. Adjoining these shops is the bolt, rivet, and screwing department, where all bolts and rivets (over ¼ in. diameter) are made.

Power Plant.

For the provision of power, there are large Babcock & Wilcox boilers, fitted with superheaters. In a separate well-lighted house are placed three Belliss & Morcom engines and dynamos and a "Unaflow" direct-coupled set, of 400, 300, 100, and 50 kilowatts respectively, with large switchboard. Adjoining are the air compressors, and pumps for hydraulic accumulators of 2000 lbs. and 1750 lbs. pressure. Compressed air and hydraulic power are conveyed round the sides of all the shops by suitable pipes.

In the punching and shearing shops are horizontal, vertical, and circular shears, all electrically driven; multiple punching machine, punching all the holes in a gasholder sheet up to 10 ft. long at one operation; sheet levelling rolls, &c. In the drilling shop are high-speed drilling machines and plate edge planers for heavy steel tank work, all motor driven; also four sets of bending and flattening rolls taking plates up to 16 ft. wide. Here also is the setting-out platform, where templates for the various parts of the work are prepared full-size. Another erecting shop leads from the platform, with cranes, pneumatic and hydraulic machines, &c. Adjoining this is a large yard for erection purposes. The erecting shop is specially arranged for dealing with heavy structural work, such as gasholder standards, &c., and there is a large erecting yard adjoining. Here the visitors saw oxy-acetylene cutting and welding.

The general stores, with the travelling gantry, the purifier erecting yard, and the planing shop are under cover, and are complete with electric cranes, four planing machines, a milling machine, motor-driven high-speed radial drilling machines, &c.

Foundry, Fitting Shop, &c.

The foundry, which was recently reconstructed, is 480 ft. long by 45 ft. wide, fitted with three electric and one hydraulic cranes, hand cranes, core drying stoves, and cupolas to melt 16 tons per hour. Castings up to 10 tons can be turned out here. The foundry is lighted by electricity; but all the remaining shops are illuminated by means of high-pressure incandescent gas lamps; the gas being made at the works by a complete coal gas plant which affords an opportunity of testing and experimenting on any new processes or plant that may be introduced.

In the fitting shop a large number of lathes, and drilling, planing, slotting, and shaping machines are in constant operation; while other special machines are called upon according to the nature of the work to be done. Many interesting processes were observed by the visitors, including valves, washers, purifying machines, sulphate stills, heaters, lead saturators, and other work in every stage of manufacture.

The pattern shop and pattern stores are large and airy. The shop is fitted with the best modern machinery. Complete lists of patterns are kept, and by this means any particular pattern can soon be found, thus facilitating the prompt supply of any replacements.

The sawmill has lately been fitted with the most modern wood-working machinery available. Here purifier sieves, hurdle grids, together with scrubber fillings, washer devices, &c., can be turned out at minimum cost. A large stock of timber, including trees ready for sawing, was seen by the visitors.

The offices are large and well lighted.

This description would not be complete without reference to the many specialities which have made the name of C. & W. Walker known throughout the world. First and foremost they are renowned for the great number and capacity of the gasholders, with or without guide framing, they have erected or built in almost every country. The firm have just secured the contract for the largest spiral-guided gasholder in steel tank that has ever been erected in England—viz., one of over 5 million c.ft. capacity (having four lifts), 41 ft. 6 in. deep; the tank being 212 ft. in diameter—at the Bournemouth Gas-Works.

Messrs. Walker are justly noted for their purifiers; and in connection with these the various patents of their Managing Director, Mr. Milbourne, are well-known and appreciated throughout the gas industry. The Milbourne internal and external purifier valves have many advantages. The Milbourne patent rapid automatic cover fastener, by means of which a luteless purifier cover may be securely fastened, or released, in one operation, in half-a-minute, has easily won its way to popularity. Where the purifiers are elevated on a girder floor, the Milbourne patent automatic safety shoot is an extremely simple device for emptying the oxide. The Milbourne-Beard four-roller spiral gasholder carriage, for which a patent has just

FIG. 3.—A PORTION OF THE SMITHY

been granted, is an interesting feature, as is also the new rubber joint for purifier covers by the same patentees. The London Office of the firm is situated at 70, Victoria Street, Westminster, S.W. 1.

Lack of space forbids further enlargement. It only remains to be said that many engineers who have received their technical training at Donnington now fill important and responsible positions, while others are being trained to carry on the honourable traditions of the firm. There is no lack of confidence among gas and other engineers in the ability and readiness of C. & W. Walker, Ltd., to turn out the very highest class of workmanship that may be demanded by the most exacting purchaser.

At the conclusion of the tour, the party adjourned to the Dining Hall at the works, where afternoon tea was provided.

Mr. CADMAN (Manchester) proposed a vote of thanks to the Directors for their kindness and hospitality, and Mr. HAWKYARD seconded this.

Mr. MILBOURNE and Mr. BEARD briefly replied.

Mild Steel and High-Tensile Steel in Concrete.—In last week's "JOURNAL" (p. 296) we published a brief review of a booklet entitled "The Relative Value of Mild Steel and High-Tensile Steel in Reinforced Concrete," published by the Western Concrete Engineering Company, Ltd., Metropolitan Steel Works, High Street, West Norwood, S.E. 27. The Company will be pleased to send this booklet to any of our readers who may be interested.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

New Edition of "Powers of Charge."

SIR,—I need hardly say it was farthest from our intention to act discourteously to anyone in the matter of the re-issue of the late Mr. Rostron's "Powers of Charge."

We purchased the copyright from his executors; and as we had no knowledge of the etiquette of the publishing trade, we thought no more need be done. My own favourite writers seem to be issued now by one firm, and then by another. But in thinking over your article, I remember that many years ago the late Mr. Walter King asked me, in respect of an address I had prepared, whether he should as usual revise and put it in order. In thanking him for his kindness, I said I should like it printed exactly as I had written it. I do not, of course, know to what extent something of this may have happened when the "Powers of Charge" was first published; but I can quite understand, what had not occurred to me before—namely, that the then staff of the "JOURNAL" had been helpful in the matter of the preparation of Mr. Rostron's work.

At any rate, it was out of print as well as out of date, and it appeared desirable that a re-issue should be undertaken in the interests not only of those who are concerned in the gas industry, but possibly of the wider public that might be reached from a general publishing house rather than from a trade one. It had also to be revised completely—for one thing, a portion of it was written in the present tense, and therefore did not offer in its most suitable form the account as it would be written to-day.

CHARLES CARPENTER.

South Metropolitan Gas Company,
709, Old Kent Road, S.E. 15,
May 9, 1927.

[We thank Dr. Carpenter for his explanation of the circumstances in which the second edition of the book "Powers of Charge" came to be transferred to another publishing-house, without any communication being made to the publishers of the first edition, as referred to in the review published on p. 300 of last week's issue of the "JOURNAL." There is full acceptance of his disclaimer of discourtesy in the matter. With reference to the subsequent parts of Dr. Carpenter's letter, the present Editor of the "JOURNAL" (acting on a friendly suggestion of the late Sir George Livesey) spent a great deal of time assisting Mr. Rostron when he was searching the records for the material on which the first edition was founded. This office, the library, and the old books in our possession were freely placed at Mr. Rostron's disposal; and here he spent much time in his research. When the work was on sale, payments were regularly made to him in respect of it. Nothing more need be said.—ED. "G.J."]

Glasgow Corporation Chemical Works Department.

SIR,—In a letter in your issue for the 4th inst., Mr. Tudsbery takes exception to certain aspects of an address given by me to the Scottish Junior Gas Association (Western District).

In reply thereto, permit me to deal first with his statement that "in order to achieve the result shown, the Glasgow Corporation have burdened themselves with a capital expenditure of about £350,000." In view of the fact that I have previously referred Mr. Tudsbery to the published accounts of the Glasgow Corporation, from which, of course, both the "Gas World" Analysis of Municipal Gas Accounts and "Field's Analysis" are compiled, I am somewhat astonished that he should make such a statement, which is so completely at variance with facts. Even if it were true, then the average net amount handed to the Gas Department during the Chemical Works Department's existence of six complete years, shown in the table in my address as £245,606, would be regarded by most people as quite a satisfactory annual return on a capital of £350,000. But a serious error exists in Mr. Tudsbery's viewpoint. The chemical works were erected by the Corporation at each of the Gas Department's four works, and leased to the various contractors, of which Messrs. Ross, Mr. Tudsbery's firm, was one. Capital was surely spent by the Corporation to enable these contractors to carry on. Was this capital expenditure justifiable on the part of the Corporation so long as contractors did the work of distilling tar and liquor, and does it become unjustifiable when contractors are dispensed with, and the Corporation Chemical Works Department is formed, to utilize the Corporation's own chemical works? The capital debt before the formation of the Chemical Works Department on the four Corporation chemical works was as follows, per published accounts, 1920:

Provan	£41,491
Dawsholm	23,815
Dalmarnock	29,886
Tradeston	28,520
A total of	£123,712

The capital debt as at the end of May, 1926, was:

Provan	£201,359
Dawsholm	41,906
Dalmarnock	41,631
Tradeston	30,537
Making a total of	£315,433

The difference between these 1920 figures and the 1926 figures—viz., £191,721—is the debt added by the Chemical Works Department since its formation. Depreciation, I may inform Mr. Tudsbery, is an amount settled by Act of Parliament, and over which this Department has no control. I think from the above it will be seen how erroneous and misleading Mr. Tudsbery's statement is.

Turning now to the question of "Costs of Tar and Liquor at Arbiter's Prices," as appearing in my table, this figure is supplied by Mr. Thomas Henderson, who is long established and highly respected, and who is the Official Arbiter. Why should I take any hypothetical figure based on something about seven years old, when I can get, and have used, actual Arbiter's figures, as supplied to gas undertakings in this area? I invariably use these figures as supplied by the Arbiter for book-keeping purposes, to arrive at what I term my true balance-sheet. I used them in the table complained of by Mr. Tudsbery, and shall most assuredly continue to employ them in preference to any hypothetical figure Mr. Tudsbery may suggest. The primary purpose of gas bye-products works is, by their operation, to assist gas departments in the reduction of the price of gas to the consumer; and this purpose it is the endeavour of this Department to fulfil. Into a question of comparative results as between the Department I have the honour to serve and any other undertaking, I decline to enter at Mr. Tudsbery's behest. The two publications so widely known throughout the gas industry, and which I have previously mentioned, are available at all times to those who find it necessary to ascertain how they compare with others.

Finally, Mr. Tudsbery refers to Glasgow's vertical retorts. Had he done me the honour of reading my address a little more carefully, he would have ascertained that Glasgow's carbonization plant does not consist of vertical retorts; and in view of the fact that a new battery of horizontals has been brought into use at Tradeston, it is unlikely to consist, in the near future, of vertical retorts.

JAMES MACLEOD.

Glasgow Corporation Chemical
Works Department,
May 7, 1927.

Institution Examination Papers.

SIR,—Will you kindly correct in your next issue an unfortunate printer's error in Question 6 of the Higher Grade Gas Supply paper reproduced on p. 312 of the "JOURNAL" for May 4?

As printed, the second sentence of the second paragraph reads: "The specific gravity of the gas is 0·22," &c. The figures on the question paper sent you were 0·52.

WALTER HOLE,
Organizing Secretary, Institution Education Scheme.

Wharfedale,
Barton,
Torquay,
May 7, 1927.

REGISTER OF PATENTS.

Retort-House Governors.—No. 268,490.

BROWN, J. T., and HOLTON, A. L., both of Manchester.

No. 3020; Feb. 2, 1926.

It is necessary to be able to adjust retort-house governors and so alter the vacuum or pressure conditions in the collecting mains of the retorts. The governors are frequently situated at a considerable distance from and above the stage floor, rendering the manipulation thereof difficult. The object of this present invention is to provide means for their remote control.

Fig. 1 is an elevation of the arrangement; and fig. 2 is a plan of the mechanism partly in section drawn to a larger scale.

These, together with extracts from the claims, clearly indicate the scope of the invention.

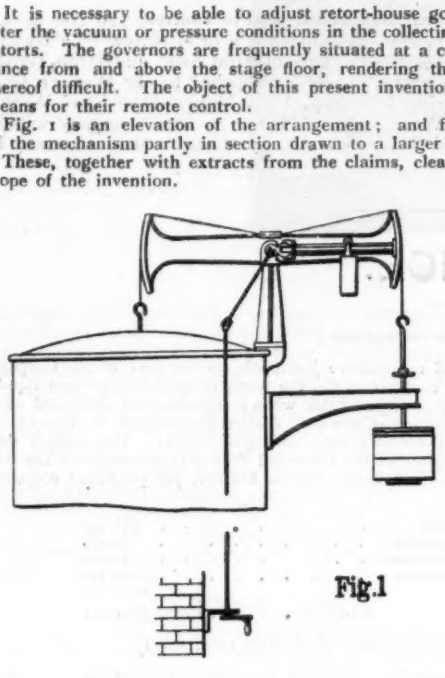


Fig.1

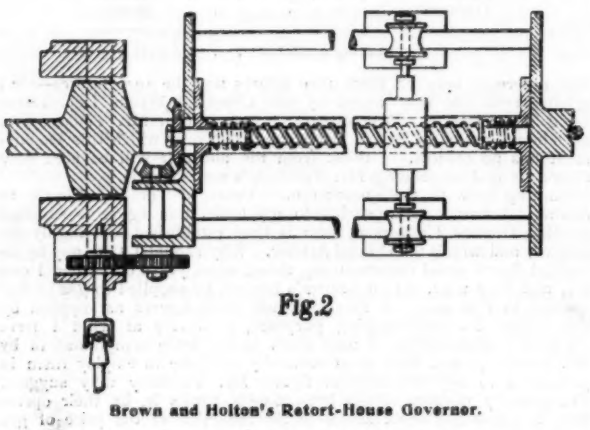


Fig.2

Brown and Holton's Retort-House Governor.

The patentees claim the arrangement of two guide rods upon the beam arm with rollers thereon upon a cross shaft or spindle from which weights are suspended at opposite ends, with means operating upon said cross shaft for traversing the same along said guide rods. The cross shaft is provided with a nut-like part in which a screw is rotated, with means allowing the nut to run off the threaded part of the screw at its opposite ends. Alternatively, the cross shaft may be traversed by a piston in a hydraulic cylinder; the pressure fluid for the latter being supplied from a cylinder with piston or diaphragm therein operated by the attendant.

Gas Purification.—No. 241,221.

KOPPERS COMPANY, of Pittsburgh (Assignees of R. A. Morgen, W. S. Yard, and L. Rosenstein).

No. 25,339; Oct. 10, 1925. Convention date, Oct. 11, 1924.

This invention relates to a process of regenerating solutions of sulphides of alkalis derived from gas purification processes—for example, a solution of sodium carbonate which has been used to scrub coal gas or the like in order to remove hydrogen sulphide and other impurities. The invention has for its primary object to achieve a direct oxidation of the sulphided liquor and liberation of free sulphur by a simple and inexpensive process that will be effective on a large industrial scale.

The invention consists in subjecting the sulphide contained in the solution to direct oxidation by means of air or oxygen that is essentially effected by means of sulphide of nickel or of cobalt operating as a catalyst; and it may be adapted to the known process which consists in scrubbing the gas with an alkaline solution and then blowing a large volume of air through the solution. As heretofore practised, the process in certain circumstances may be undesirable because of the emission into the atmosphere surrounding the gas-works of an amount of hydrogen sulphide.

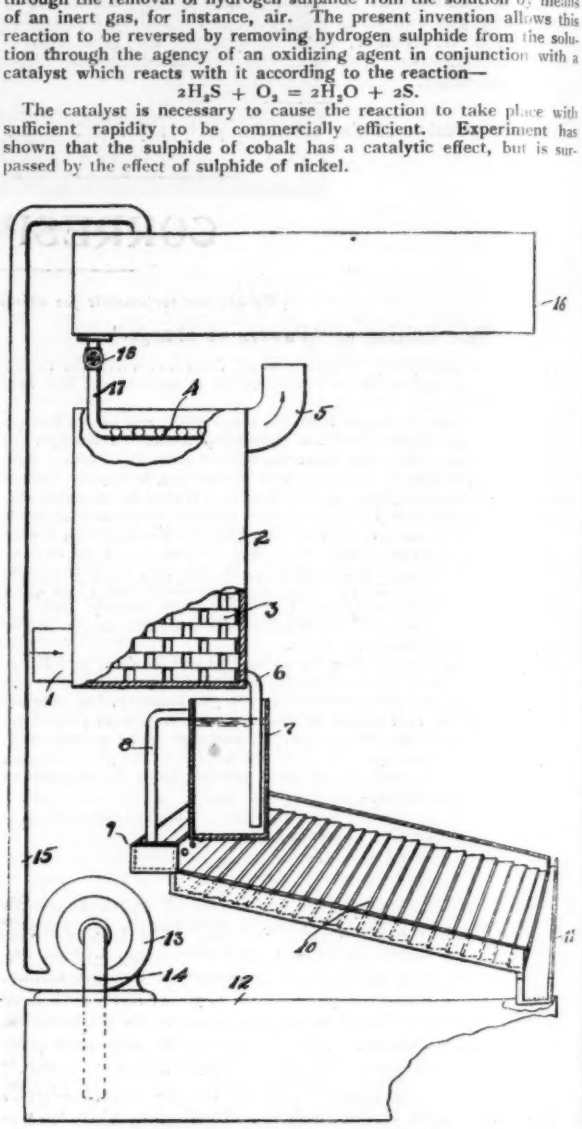
The principle upon which the prior process is based may be described as the reversal of the reaction

$$Na_2CO_3 + H_2S = NaHCO_3 + NaHS$$

through the removal of hydrogen sulphide from the solution by means of an inert gas, for instance, air. The present invention allows this reaction to be reversed by removing hydrogen sulphide from the solution through the agency of an oxidizing agent in conjunction with a catalyst which reacts with it according to the reaction—

$$2H_2S + O_2 = 2H_2O + 2S.$$

The catalyst is necessary to cause the reaction to take place with sufficient rapidity to be commercially efficient. Experiment has shown that the sulphide of cobalt has a catalytic effect, but is surpassed by the effect of sulphide of nickel.



Koppers' Apparatus for H_2S Removal.

The drawing illustrates diagrammatically an apparatus capable of carrying out the process; the apparatus being shown partly in perspective and partly broken away. 1 indicates a gas inlet and 2 a tower containing checkerwork 3, over which the solution to absorb the hydrogen sulphide flows from the spray 4, the purified gas passing out of the discharge pipe 5.

The solution from the tower passes out through the pipe 6 into the bottom of the tank 7, whereby the pipe is kept liquid sealed to prevent the gas escaping. The solution contains the above-mentioned insoluble nickel sulphate, which may be introduced into the circulating system either directly or by the usual well-known transformation that nickel sulphate undergoes when it meets the soluble sulphides in such a solution. The nickel sulphide is present as a catalyst, and therefore in the slight amount that characterizes a catalyst; and so neither it nor any nickel compound from which it may be derived is introduced in an amount that could be effective stoichiometrically, instead of catalytically, in the purification or regeneration process. For instance, a hundredth of 1 p.ct. of nickel is effective catalytically in the solution derived from treating ordinary oil gas or water gas or coal gas. The solution overflows from the tank 7 via the pipe 8 to the launder 9, which launder spreads the solution over the stepped sluice way 10. A launder 11 delivers the regenerated solution to the tank 12. The pump 13 is operated at any time to deliver the solution from the tank 12 via pipes 14 and 15 to an upper tank 16, which has a pipe 17 leading to the spray 4, valve 18 regulating the flow at the spray. The object is to run the pump 13 only when the tank 12 has filled, whereby the plant requires very little attention.

It will be seen that as the sulphide charged solution passes over the sluice 10, the exposure to the oxygen of the air is sufficient to

cause the deposition of the free sulphur, which can be removed from time to time as it may collect on the sluice way.

In a specific application of the invention, gas containing 200 grains H_2S per 100 c.ft. was treated at a rate of 2000 c.ft. per minute. The liquid contained nickel sulphide equivalent to less than 0·01d. p.ct. Ni, or approximately 5 grains Ni per gallon. It was circulated at a rate of 160 gallons per minute. Approximately 1000 grains Ni were, therefore, circulated per minute to treat 4000 grains H_2S per minute. In the stoichiometric relation between nickel and hydrogen sulphide, 1 atom of nickel or 58 parts by weight is equivalent to 1 molecule of hydrogen sulphide or 34 parts by weight. In this relation there would have been required 6800 grains Ni per minute to treat 4000 grains H_2S per minute. The amount of nickel compound used was, therefore, about one-seventh of even the theoretical minimum, and a far smaller fraction of the practical minimum required by the stoichiometric relation.

Preferably the catalyst is introduced into the system by adding to the liquid coming from the scrubbing tower a small quantity of some soluble nickel salt such as nickel sulphate. This at once reacts with some of the sodium sulphide in the solution to form a very finely divided, and, of course, insoluble nickel sulphide in suspension. The solution carrying this nickel sulphide is sent through the regeneration stage of the process, in which the solution is exposed to extended surface contact with air. Oxygen is absorbed, and the solution emerges nearly free from the soluble sulphides and containing nearly the same percentage of sodium carbonate as originally; and, of course, the insoluble nickel sulphide remains, and continues in the recirculation of the regenerated liquid to and through the scrubbing tower.

Various factors are of great importance in determining the rapidity with which the desired reaction will go on in the presence of a fixed amount of the catalyst. One of the principal factors is the proportion of sodium bicarbonate to sodium carbonate in the solution. It appears that the reaction goes on rapidly when there is in the solution about four times the amount of bicarbonate that there is of the carbonate. A larger proportion than this of the bicarbonate appears to do no harm; but if the proportion falls much below this, the speed of the reaction becomes much less.

The process may also be used to remove sulphides from solutions of alkalis other than sodium carbonate. Thus, if a solution of sodium phosphate is used to scrub the gas it may be regenerated with the aid of sulphide of nickel or cobalt.

It will also be seen that this process does not require large volumes of air or other inert gas to be blown through the solution to free it of the hydrogen sulphide, and that no hydrogen sulphide is discharged into the atmosphere. Instead, this objectionable compound is destroyed by merely exposing the solution to the air, with the immediate formation of free sulphur, and without either employing aeration to carry off hydrogen sulphide or any need for large volume blast aeration.

Drying of Gases.—No. 268,429.

HOLMES, W. C., & CO., LTD., PARKER, J., and HENSHAW, D. M., all of Huddersfield.

No. 32,999; Dec. 31, 1925.

This invention relates to the drying of fuel gases; the patentees referring to specifications Nos. 248,841 [" JOURNAL," Vol. 174, p. 164] and 266,825. In the former it was indicated that drying may be carried out to an extent sufficient to prevent the deposit of liquid water in the distributing mains under average conditions.

In certain cases, however, it may be desirable to reduce the moisture content of the gases still further; and the present invention consists broadly in effecting a partial removal of the water contained in fuel gases by the use of hygroscopic or water-absorbing bodies in the liquid state, and subjecting the gases to a further treatment with solid bodies which will not yield liquid products as the result of their taking up water from the gases.

Normally the bodies used will possess in a degree greater than the material used in the initial treatment the capacity to remove water; and they may be materials which on account of expense would not be adapted from a commercial point of view for the removal of the whole of the water in the gases.

As examples of solid bodies which may be used, the patentees mention silica gel, calcium carbide, and aluminium carbide. The employment of metallic carbides which react with water presents also the advantage that relatively small proportions of gases possessing a characteristic odour are formed, and consequently the possibility of injury to health due to the unsuspected leakage of gases containing a high proportion of carbon monoxide is minimized. Cooling of the gases prior to subjecting them to the action of the solid absorbent may be effected if desired.

A wide variety of apparatus may be used for carrying the invention into effect. Thus, towers provided with suitable packing or distributing means may be used for securing intimate contact between the hygroscopic bodies in the liquid state and the gases; or brush washers may be employed. For contact between the gases and the solid water-absorbent, towers or similar devices, provided or not with means for continuously or periodically introducing and withdrawing the material, may be used.

APPLICATIONS FOR PATENTS.

[Extracted from the " Official Journal " for May 4.]

Nos. 10,959—11,616.

ALLEN, S. R.—" Flue blocks for gas fires, &c." No. 11,260.
COBBAERT, A. R. M. B.—" Cooling apparatus for coke, &c." No. 11,042.
CROSSLEY BROS.—" Grids for gas purifiers." No. 11,549.
CROSSLEY, G. S.—See Crossley Bros. No. 11,549.
CROSSLEY, H.—See Crossley Bros. No. 11,549.
DOWSON & MASON GAS PLANT CO., LTD.—" Gas-fired annealing furnaces." No. 11,115.
DVORKOVITZ, P.—" Manufacture of carburetted water gas." No. 11,272.
LEDERER, R.—" Apparatus for producing gas." No. 11,378.
LEE, A. S.—" Gas tar filter extractor." No. 11,297.
LOW TEMPERATURE CARBONISATION, LTD.—" Distillation retorts." No. 11,295.
PARKER, C. H.—See Low Temperature Carbonisation, Ltd. No. 11,295.
PEARCE, S.—See Cobbaert, A. R. M. B. No. 11,042.
RADIATION, LTD.—See Allen, S. R. No. 11,260.
TERRY, G.—" Gas, &c., cocks." No. 11,233.
THOMPSON, G. E.—See Lee, A. S. No. 11,297.
WELLINGS, J. F.—" Setting horizontal retorts, &c." No. 10,978.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Companies Bill: Read a second time, and committed to a Committee of the whole House on Thursday, May 19.

Farnham Gas and Electricity and Reading Gas Bills: Read the third time, with amendments, and passed; returned to the Commons.

Matlocks Urban District Council and Stoke-on-Trent Corporation (Gas) Bills: Read a second time, and committed.

South Staffordshire Mond Gas Bill: Read the third time, and passed; sent to the Commons.

West Bromwich Corporation Bill: Brought from the Commons, read the first time, and referred to the Examiners.

HOUSE OF COMMONS.

Progress of Bills.

Commercial Gas Bill: Reported, with amendments.

South Staffordshire Mond Gas Bill: Read the first time, and referred to the Examiners.

West Bromwich Corporation Bill: Read the third time, and passed.

GAS PRICES.

The matter of gas prices was raised in the House of Commons on Tuesday, May 3; three questions having been set down for answer by the President of the Board of Trade.

Lieut.-Commander KENWORTHY asked whether, in view of recent increases in the price of gas and the wide public concern now being shown on account of greatly increased bills for the past quarter, he would require gas companies to render accounts monthly instead of quarterly, so that the public might have more frequent opportunities of checking gas consumption and charges.

Colonel WEDGWOOD drew attention to the exceptional increase of domestic gas bills in some parts of London, and asked if inquiries could be made as to the desirability of taking power to check the consumption as recorded in the present meters.

Mr. CAMPBELL referred to the abnormal consumption of gas as indicated in the accounts rendered to consumers by the Gas Light and Coke Company during the past quarter, and desired to know whether the President would consider appointing a Committee of Inquiry into the matter.

Sir P. CUNLIFFE-LISTER answered the foregoing questions together. He stated that his attention had been called to complaints as to gas bills rendered in respect of the March quarter. So far as these were based on suggestions that charges have been made for quantities in excess of those actually consumed, it was already possible for any consumer to have his meter tested by an officer of the local authority of the district—in the London area, the London County Council. The consumer, therefore, was fully safeguarded in this respect. Regarding the suggestion that accounts should be rendered monthly, every consumer had on his meter a continuous record whereby he could check his consumption at any time. To compel the monthly rendering of accounts would involve the extra cost of monthly, as opposed to quarterly, readings and rendering and collection of accounts, which cost would fall on consumers, and would involve them in paying monthly instead of quarterly. He doubted whether this would be in the interest of the consumers or would command their approval. Under the Gas Regulation Act, 1920, the local authorities tested calorific value, purity, and pressure of gas supplied; and these tests had been regularly carried out in the London area. The tests showed that during the March quarter all the London Gas Companies fulfilled their statutory obligations. In view of these facts and the powers given to local authorities by legislation, he did not think any useful purpose would be served by a special inquiry.

Replying to further questions by Lieut.-Commander Kenworthy

and Colonel Wedgwood, Sir P. Cunliffe-Lister said he had satisfied himself that the local authorities in London had most thoroughly dealt with this matter; in fact, the London County Council had made all the regular inspections which the Act required them to make. He did not think it would be right or desirable to take out of the hands of the local authorities the duties which Parliament so recently conferred upon them. Under the Act of 1920, tests had to be made for calorific value, purity, and pressure of the gas supply. He had made special inquiry with regard to London, and found that the tests had been regularly carried out. Sir Philip pointed out that consumers did not pay for the volume of gas that passed through the pipe, but only the calorific value.

COMMERCIAL GAS COMPANY'S BILL.

The Unopposed Bills Committee of the House of Commons, over which Mr. J. FITZALAN HOPE (Chairman of Ways and Means) presided, on Wednesday, May 4, ordered the Bill promoted by the Commercial Gas Company, by which power is sought to apply the basic price and basic dividend principle, to be reported for third reading. The Bill has already passed the House of Lords, in which House also it was unopposed. (See "JOURNAL" for Jan. 5, p. 34, and March 30, p. 820.)

Mr. T. SEAGAR BERRY (Messrs. Sherwood & Co., Parliamentary Agents), on behalf of the Company, said that provisions similar to those now sought were granted to the South Metropolitan Gas Company by their Act of 1920, which had been considered by this Committee after a considerable contest in the House of Lords.

The CHAIRMAN asked if the Gas Light and Coke Company had similar powers.

Mr. BERRY replied that they had not, but, by their Act of last year, they had applied a rather different principle—viz., they had continued the sliding-scale principle, with a minimum dividend of 5 p.ct. Explaining to the Committee the working of the basic price and dividend scheme now proposed, he said the proposed basic dividend was 5 p.ct. on the existing ordinary capital, and 6 p.ct. on the new ordinary capital. The basic price was to be 11d. per therm, which was the same as that of the South Metropolitan Company. If the gas were sold at 10d. instead of 11d. per therm by the Commercial Company, the difference between the revenue obtained and the revenue which would have been obtained if the gas had been sold at 11d. was £15,000. This £15,000, therefore, was a saving to the consumers in the form of a reduction of price. If the Company then had sufficient money in their coffers, they would be entitled to devote an amount equal to one-sixth of that sum—namely, £2500—to increase of dividend; and another similar amount could be paid to the employees' co-partnership fund. The £2500 would represent an increase of dividend of 2s. 6d. p.ct.; so that if gas were sold at 10d. instead of 11d. per therm, the dividend allowed was £5 2s. 6d. p.ct.

The CHAIRMAN asked if that were the same as in the case of the South Metropolitan Company.

Mr. BERRY replied that it was. He pointed out, however, that the Commercial Company, being a smaller Company than the South Metropolitan Company, had always had a higher price—he was going back to the seventies—but the London County Council had pressed the Commercial Company to insert in the present Bill the same basic price as that of the South Metropolitan Company; and this had been done.

In reply to a further question, he said that the greater part of the Company's area of supply was within the County of London area; but there was a little in West Ham.

A report had been made by the Board of Trade on the provisions of the Bill, and all the suggestions in that report had been met.

Sir ERNEST MOON, K.C. (Speaker's Counsel), referred to the recommendation by the Board of Trade that the Committee should inquire whether a certain clause in the Bill was necessary or desirable. This clause was one giving the Company power, at the request of the consumer, to test his meter. If it were found to be correct, the consumer had to pay the cost of testing, but if it were not correct, the Company were to pay. The clause, said Sir Ernest, seemed to be both necessary and desirable.

Mr. BERRY said he would have thought so. Under the old Acts, he said, the Company had a right to inspect a consumer's meter if the consumer had bought the meter; but if it were a meter which had been provided by the Company, the latter had not the right to inspect it. Therefore, the power was wanted.

The preamble of the Bill was proved by Mr. *F. J. Bradfield* (General Manager and Secretary to the Company).

A clause containing further provisions relating to the basic price was inserted in the Bill, at the instance of the Board of Trade. Under this clause the Company are, from time to time, to file for public inspection with the local authority and with the Board of Trade statements of the conditions under which they are prepared to grant discounts on prices charged by them. Any such discounts granted by the Company shall be alike in like circumstances. It also provides that no sum shall be divided in excess of the basic rate or carried to the reserve fund, or paid to the co-partners, in respect of any period in which the price charged to the ordinary consumer is equal to, or more than, 0·04d. per therm in excess of the basic price. The Company are to send each year to the Board of Trade, with the accounts already required to be sent, a statement showing the number of therms sold at each of the several net prices during the year to which the accounts relate (including gas supplied to public lamps), and such other information relative to those matters as the Board may require. The accounts of the Company for each year are to contain such particulars as will enable the local authority to calculate the amounts which may be paid each year as dividend or transferred to the reserve fund, and paid to the co-partners.

MANCHESTER CORPORATION BILL.

This Bill, which proposed to extend the Manchester city boundaries (see "JOURNAL" for Jan. 19, p. 145), has been under consideration by a Committee of the House of Commons for some time. The Bill also provided that the Corporation could, by agreement with the Stretford and District Gas Board and the Altrincham Gas Company, acquire so much of their undertakings, rights, and privileges as were situate within the added area. The Committee have now decided not to grant the powers for extension; and, in consequence, the clauses relating to the acquisition of the appropriate parts of the gas undertakings were also struck out of the Bill.

SOUTHERN RAILWAY BILL.

A Bill promoted by the Southern Railway Company, authorizing the carrying-out of a number of works in connection with the Company's undertaking, was ordered by the Unopposed Committee of the House of Commons (presided over by Mr. J. FITZALAN HOPE, Chairman of Ways and Means), on Wednesday, May 4, to be reported for third reading. Among the original petitioners against the Bill were the Gas Light and Coke Company and the Wandsworth, Wimbledon, and Epsom District Gas Company; but their opposition was withdrawn on the insertion of clauses affording protection against damage to their mains and apparatus which might be caused by the Railway Company in the carrying-out of the works authorized by the Bill. These clauses are in the usual form.

LEGAL INTELLIGENCE.

A NEW ZEALAND APPOINTMENT.

Gas Engineer's Claim Fails.

In the King's Bench Division of the High Court of Justice on April 26, 27, and 28, Mr. Justice MCCARDIE and a Special Jury heard an action brought by Mr. William Edward Barnett, Gas Engineer, of Grosvenor Road, Aldershot, now holding a Government appointment in Nigeria, who sued Messrs. William Coward & Co., Ltd., of 22, Buckingham Gate, Westminster, from whom he claimed damages totalling £3000 for alleged breach of warranty, negligence, and fraud. The whole of these allegations the defendants repudiated entirely.

It was stated that plaintiff sold up his home and went with his wife and four children to New Zealand, in September, 1923, on the understanding through Mr. A. M. Scott, a Director of the defendant Company, that he was to have a five years' agreement as Gas Manager to the Nelson City Council. His salary was to be £600 a year, with emoluments of about £200 a year. Plaintiff said there was no question of a speculative trip—that Mr. Scott urged him to go out. He got a form for an assisted passage, which was signed by the defendant Company, as London Agents for the Nelson City Council. On arriving at Auckland, he learned that there was no appointment for him. A letter sent by the Town Clerk of Nelson to defendants stated that there was no intention of appointing a Gas Manager; that the gas-works had not been without a Manager; and that defendants had no authority to act for the Council.

The defendants, on the other hand, said they were buying agents for numerous Overseas Councils and Corporations, including the Nelson City Council; and that it was made clear to plaintiff that he had no engagement.

Mr. GALLOP, who appeared for Mr. Barnett, upon opening his case, said he had advised plaintiff that in his opinion there was no foundation for alleging that Messrs. Coward or Mr. Scott were actuated by the slightest improper motive. He withdrew the allegation of fraud, and expressed the view of plaintiff that the charge was mistakenly made—it was an error of judgment, and ought not to have been put forward.

Mr. Justice MCCARDIE said he agreed to any such charge being withdrawn; but the public interest must be guarded in a case such as this, which might be of importance to people who intended to emigrate to the Dominions.

Plaintiff, in the course of his cross-examination, said he went to New Zealand on the strength of Mr. Scott's assurance that he would be appointed to the post in Nelson, and because he was told the defendants were the Council's Agents to appoint him. He admitted he had sold his house at Bournemouth before he had heard anything about the Nelson appointment.

Mr. Justice MCCARDIE asked the plaintiff what he meant by telling the jury that he had sold his house in consequence of an interview with Mr. Scott, and pointed out that he had actually been claiming damages because he had acted on Mr. Scott's advice, whereas it turned out that he had been trying to sell the house before he got any advice whatever.

Counsel for defendants pointed out that the falsehood to which his Lordship had alluded appeared in the statement of claim.

Mr. Justice MCCARDIE read a letter from the defendants to the plaintiff which ran: "We also wish you a safe voyage, and hope you won't be long in New Zealand before you find yourself in a

satisfactory position." This did not seem consistent with plaintiff's story of an engagement.

Witness replied that he had not read this in the light that he was going out to look for employment.

After hearing the legal arguments at the close of plaintiff's evidence, his Lordship delivered judgment.

THE JUDGMENT.

Mr. Justice MCCARDIE: In my view there is no case to go to the Jury. At the opening of this matter, the learned Counsel for the plaintiff withdrew fully and explicitly and finally any charge of fraud that might have been made against the defendants. That being so, he has sought to find, if he can, some other cause of action. The first suggested cause of action is breach of warranty of authority. It has been said that the defendants warranted that they had authority, on behalf of the Nelson City Council of New Zealand, to make a five-years' agreement of service with the plaintiff at a certain salary, and with certain emoluments. Incidentally I may point out that what the other terms of the contract would have been, or might have been, is wholly obscure; but this alleged contract of service was, so far as it appeared before the Court, purely verbal. Now the Statute of Frauds applies to this period of five years. If the defendants had authority to make this contract on behalf of the Nelson City Council, and had made it with the plaintiff, it would still have been wholly void and unenforceable under the Statute of Frauds, and there would have been no effective contract at all between the plaintiff and the City Council. The assumption—indeed, I think it was conceded—is that the Statute of Frauds, which is English law, applies also in New Zealand, in the absence of express evidence to the contrary. That principle is laid down by the Privy Council in *"The Pachim,"* 1918 Appeal Cases, p. 161; and also by the Privy Council in the *Dynamit v. Rio Tinto* case, in 1918 Appeal Cases, at p. 301.

In my view the facts here disclose no cause of action by the plaintiff with respect to this alleged warranty of authority. I think that *Pow v. Davis,* in 1 Best & Smith, p. 220, decides the principle—a principle which has been recognized and applied in other branches of the law; a principle which I think is sound and effective.

The second cause of action which is suggested was a cause of action against the defendants for negligence. There might be a cause of action for negligence if the defendants were agents for the plaintiff, and owed a duty to the plaintiff; but the very ratio of the plaintiff's claim is that they were professing to act as agents for the Nelson City Council. They were not agents for the plaintiff, and I see nothing which casts a duty upon them; and if there were no duty towards the plaintiff, there would be no cause of action for negligence, as pointed out by Lord Esher in *LeLievre v. Gould,* 1893 1 King's Bench, p. 496. There is, therefore, no cause of action for negligence.

The third suggested cause of action was that the defendants apparently had made some contract with the plaintiff for maintenance while in New Zealand. The only ground for that suggestion is that there are certain words to that effect in the nomination form signed by the defendants and addressed by the defendants to the High Commissioner for New Zealand. Suffice it to say that there is no ground whatever for suggesting this third cause of action; no contract to that effect was made between the defendants and the plaintiff. The result is that in my view the action fails; and I see nothing to go to the Jury to consider.

I desire to add this: That in my view no injustice whatever has been done to the plaintiff by my ruling that there are no causes of action here to be considered by the Jury. I think myself that the claim is baseless, and that the correspondence which has been put in is wholly inconsistent with the allegations he makes as to that which he says was stated by the defendants. Any verdict by the Jury which might have been given in his favour, apart from the legal difficulties which arise, would in my view have been plainly contrary to the evidence.

And I desire to add one thing more, which I think is a very grave aspect of this case: It is quite clear, both from the statement of claim and from the plaintiff's evidence in the witness-box, that he was inviting the Jury to say that he sold his house at Bournemouth because of the statements made to him by the defendants with regard to the Nelson City Council. That allegation in the statement of claim is baseless; and the plaintiff's evidence in my view was evidence which he knew to be false, because it is plain that he had agreed to sell his house at Bournemouth before the Nelson City Council was mentioned to him by the defendants. He had arranged that his house should be offered for auction before he ever saw the defendants. And yet this plaintiff was putting forward to the Jury what I describe, and describe plainly, as a most fraudulent head of claim. No injustice has been done by my withdrawing this case from the Jury; and, therefore, in this case, there must be a verdict for the defendants, with costs.

This letter from the Estaté Agents, which states the facts, will remain in the possession of the Court, pending any view that may be formed by the defendants as to whether further proceedings of a criminal character should be taken.

Mr. GALLOP: May I make one observation on behalf of my client on that aspect of the case?

Mr. Justice MCCARDIE: Yes.

Mr. GALLOP: Would your Lordship possibly bear in mind that in voluntarily tendering that letter to the Court, I coupled with it an intimation that my instructions were that the plaintiff had no recollection of the accuracy of the facts in that letter?

Mr. Justice MCCARDIE: I only point out to you, and make no comment, that the man who says he has no recollection of the facts with regard to the sale of his house is a man who testified in the most precise manner to the most detailed items of conversation with the defendants.

Mr. GALLOP: I accept that. I am speaking simply as Counsel for my client in this action; and I may reserve my own view of the the whole matter. I simply desire it to be understood that the letter has not been handed up as an admission by my client.

An Irish Libel Action.

In the King's Bench Division of the Northern Ireland High Court, at Belfast, before Lord Chief Justice Moore and a Special Jury, an action was heard in which Mr. Terence Ruddy, Chairman of the Newry Urban Council Gas Committee, sought damages from Mrs. John Fearn and others, trustees on behalf of the Irish Transport and General Workers' Union, and Messrs. Cahill & Co., Ltd., printers, of Dublin, for libel alleged to have been contained in an article in a weekly paper "The Voice of Labour," the organ of the union indicated, in which plaintiff was accused of corruption and jobbery in his conduct as Chairman of the Gas Committee. It was alleged that Mr. Ruddy used his influence unduly to secure employment at the gas-works of certain men. This plaintiff denied, and evidence in support of his case showed that the Works Manager had no regard for Mr. Ruddy's influence than that of any other member of the Committee, and that he had not exercised his influence unduly. Witnesses for the defence were of the opinion that the article was accurate in its reference to the plaintiff's conduct. The Jury found for Mr. Ruddy, with £250 damages.

MISCELLANEOUS NEWS.

MANCHESTER GAS COMMITTEE'S ESTIMATES.

The Manchester Gas Committee at their recent meeting (Alderman T. Cook presiding) had before them the estimates for the ensuing municipal year. The total income is estimated at £1,787,460, and the total expenditure, including full provision for renewals, at £1,671,631, leaving a balance of £115,829. Charges on loans for sinking fund and capital expenditure out of revenue total, however, £265,944, leaving a deficit on appropriation for the year of £150,115.

The cost of coal during the year, owing to the stoppage, was in excess of the estimate by £477,783. Receipts for residuals amounted, however, in excess of the estimates to £173,556; and deducting this from the former sum, the net increase in the coal cost was £304,227.

There was an increase in the amount of gas produced in the year. This in 1926 reached a total of 7,386,356,000 c.ft., and in the year ended 1927 to 7,668,482,000 c.ft., or an increase of 3·82 p.ct. In the same period the number of cookers and grillers in use increased from 156,755 to 161,220, or 2·84 p.ct. Gas fires increased in number from 46,717 to 50,357, or 7·79 p.ct.

With regard to the price of gas, the Committee hope that, within the next few months, they may find it possible to make a substantial reduction.

In Greenock numerous complaints have been made about automatic gas meters being broken open and the contents stolen; and investigations by the police culminated in the apprehension of Neil Turner and Joseph M'Henery, who subsequently at the Greenock Sheriff Court were each sentenced to imprisonment for six months and five months respectively. Most of the thefts were committed at the houses of relatives and friends. In Turner's house the police found a key which fitted the automatic meters used in Greenock.

MANCHESTER METER TESTING.

The Official Inspector of Gas Meters for the City of Manchester (Mr. Arthur Winterbottom) has submitted to the Lord Mayor and Magistrates of the city the report of the City Justices' Gas Meter Testing Department for the year ended March 31.

The number of meters tested during the year amounted to 82,285, showing an increase of 12,265 as compared with the previous year. The fees charged amounted to £4632; total receipts being £4724. Of the meters tested, 3091, or 3·75 p.ct., were rejected. Of the wet meters tested—viz., 5924—378, or 6·38 p.ct., were rejected; and of 76,361 dry meters tested, 2713, or 3·55 p.ct., were rejected. The number of prepayment meters tested during the year was 51,212; the remaining 31,073 being meters of the ordinary type.

Cause of Error in Meters Rejected.

—	Leaks.	More than 2 P.Ct. Fast.	More than 3 P.Ct. Slow.	Passes Gas Without Registering.	Will not Pass Gas.	Excessive Absorption of Pressure.	Other Faults.	Total.	P.Ct.
New wet meters.	11	3	3	..	1	3	2	23	1·19
Old wet meters.	125	117	4	26	17	1	65	355	8·87
New dry meters.	35	235	113	159	12	27	12	593	1·32
Old dry meters.	242	950	289	367	61	117	94	2120	6·67
	413	1305	409	552	91	148	173	3091	..

NOTTINGHAM GAS UNDERTAKING.

Profit of £86,438.

It has long been the practice in Nottingham to look for substantial profits from the gas undertaking; but having regard to the strike of last year, with the consequent increase in the price of coal, the conditions had been such as apparently to preclude any optimistic anticipations respecting the outcome of the trading operations. Yet, with characteristically sound management, seemingly impossible results have been achieved.

The report made up to March 31 last shows that the income for the year on revenue account amounted to £702,444, and the expenditure to £616,006, leaving a balance of £86,438 to be carried to the profit and loss account. After charging interest on capital, contributions to sinking funds, and £20,000 for depreciation of mains, meters, and stoves, there remained an available balance of £56,327. The Committee, having decided to allocate £30,000 in aid of the general district rate, recommend that the balance of £26,327 be carried forward. The balance of revenue account is £35,578 less than last year.

The new coal contracts, which the Committee were able to arrange early in the year, represented an average price of approximately 20s. per ton; but the coal strike intervened, and it became necessary to obtain supplies from other sources. Local outcrop coal was tried; but it was found very inferior in quality and uneconomical in use—the yield of gas being extremely small, and the coke practically unusable. Arrangements were therefore made to purchase imported coals, mainly from America and Silesia; and at a later date it became possible to make purchases of British emergency coal. The average cost of these coals was 53s. 9d. per ton; and the extra cost of the coal purchased in consequence of the strike was approximately £115,000. A full supply of gas was maintained throughout the strike, the only inconvenience suffered by the consumers being a reduction in the calorific power. Full use had to be made of the carburetted water gas plant at the Basford Works; and it might be that the Committee would decide to instal additional plant to meet emergency conditions in the future.

The quantity of gas sold during the year was 2,895,290,000 c.ft. (13,752,627 therms), compared with 2,699,267,000 c.ft. (12,821,518 therms) for the previous year—an increase of 196,023,000 c.ft. (931,109 therms), or 7·26 p.ct. As a result, the increased income from gas amounted to £10,251. The quantity of gas sold per ton of coal carbonized was 13,627 c.ft. (64·7 therms), as compared with 12,909 c.ft. (61·3 therms). The increase is the result of the Department working in accordance with the Coal (Emergency) Directions; and a reversion to a normal figure must be expected next year.

The increase of £43,473 17s. 2d. in the receipts for coke was the result of the high prices which prevailed during the period of the coal strike for all classes of fuel. The demand for coke was considerably in excess of the supply available, and priority had to be given to users within the area of gas supply; a large quantity being disposed of for domestic use in parcels of 28 lbs. In these circumstances, it was necessary to restrict supplies to the contractors, who usually dispose of a large proportion of the Committee's production in other towns and districts; and difficulty is now being experienced in obtaining orders from these contractors, notwithstanding the fact that substantial reductions in price have been declared. There being a glut of fuel on the market at the present time, still lower prices for coke must be anticipated.

The prices of tar products were also favourably affected by the strike, seeing that practically the whole of the coke ovens in the country were out of commission for at least six months. The coke oven industry now produces practically as much coal tar as the gas industry; and any prolonged stoppage in the former industry must necessarily create a shortage of coal tar.

Reference was made in the last report to the proposed reorganization of the coal industry, and the possibility of some scheme being evolved under which a supply of gas would be obtainable from coke ovens to be erected in the neighbourhood of Nottingham. A contract for the supply of coke oven gas had actually been entered into; but the scheme fell through, and the contract had to be cancelled. No new proposals have been put before the Committee; but information has been received that the question of erecting coke oven plant near to Nottingham is once more receiving consideration.

Mr. John Wilkinson's Report.

The annual report of Mr. John Wilkinson, the Engineer and Manager, states that during the period under review 191,253 tons of coal and 560,096 gallons of oil were utilized in the course of manufacturing the following: Coal gas, 2,742,488,000 c.ft., or 13,237,335 therms; water gas, 304,191,000 c.ft., or 1,310,316 therms—total, 3,046,679,000 c.ft., or 14,547,651 therms. Coke (for sale), 89,895 tons; tar, 11,109 tons; and ammoniacal liquor (10 oz. strength), 29,482 tons.

The total length of mains laid at March 31 was 454·76 miles, and during the year 3188 new gas services were connected to the mains, against 2981 in the previous year. The number of meters fixed at March 31 (excluding 456 lamp meters) was 98,282, being an increase of 2717 on the previous year. The average consumption per meter (exclusive of lamp meters) equalled 27,942 c.ft. (132·7 therms), as compared with 26,346 c.ft. (125·1 therms) in the previous year. According to official records, there were in use at March 31 55,670 gas cooking stoves, and 26,746 gas fires. These figures do not include a number of cooking stoves, fires, and other appliances of various descriptions which have been purchased privately by the consumers. The number of public gas lamps erected within the area of supply at March 31 was 8808.

The Bridge of Allan Town Council have decided to reduce the price of gas from 1s. 11d. to 1s. 8d. per therm—a reduction equal to 1s. 3d. per 1000 c.ft.

INQUIRY AT HELSTON.

On Tuesday, April 26, Mr. J. W. Mason, an Inspector of the Ministry of Health, held an inquiry at Helston into the Town Council's application for sanction to borrow £3500 for the provision of a new holder at the gas-works, and for certain other purposes.

The Deputy Town Clerk stated that the Helston Gas Order, 1924, sanctioned and confirmed an agreement whereby the Mayor, aldermen, and burgesses of Helston agreed to purchase the property and business of the Helston Gas Company. At that time the greater part of the plant, mains, machinery, and apparatus were in a bad condition—a fact that was fully understood and recognized on all sides. Particularly was it understood that the gas undertaking could not continue to rely for more than two years on the two existing gasholders, which were erected in 1870 and 1872 respectively. The maximum daily consumption was 42,000 c.ft., and the average about 22,000 c.ft. The present holders, the combined capacity of which was 24,000 c.ft., were therefore inadequate; and in the event of a breakdown there was a reserve of only half-a-day's supply. On the nights of market days, the pressure was particularly bad, especially in the lower part of the town, and there were continually complaints from private consumers. On these occasions the public lamps became dimmed. Helston was a growing town; but with the present holders the demand by existing customers for gas could not be met—much less could new customers be supplied. It was now proposed to instal a new holder of a capacity of 50,000 c.ft., which, with the existing 1872 holder's capacity of 18,000 c.ft., would give a total capacity of 68,000 c.ft., equivalent to approximately two days' consumption in winter. The 1870 holder was to be scrapped, and the well used as a tar container. Subject to the approval of the Ministry, a tender had been accepted of £2490 for the supply of a new holder, with an additional £245 for transferring the meters to the new meter house.

The *Borough Accountant* said that during the first fourteen months the gas undertaking was under the control of the Corporation a net profit of £110 was made; but the year ended March, 1927, showed a debit balance of £188, which was accounted-for by the large increase in the price of coal during the stoppage last year, and to the fact that expenses totalling £180 incurred in securing the Gas Order had been paid out of current revenue.

No opposition was forthcoming; and the Inspector remarked that, though there seemed to be no question as to the necessity of a new holder, he had to be satisfied with regard to the financial position, and would report to the Ministry after visiting the gas-works.

THE PUBLIC AND ROAD MOTOR TRANSPORT.

At the Salisbury Rotary Club on May 9, Mr. F. G. Bristow, who is the General Secretary of the Commercial Motor Users' Association (Inc.), and Hon. Secretary of the Standing Joint Committee of Mechanical Road Transport Associations, gave an address on "The Public and Road Motor Transport." Discussing the development which has taken place during the last twenty years (in 1906 the number of commercial motors in use was 4000; in 1926 it was 355,000), Mr. Bristow said that it does not seem unreasonable to suggest that before very long the number of commercial motor vehicles in Great Britain will be more than 500,000; the amount of annual direct taxation will be in excess of £12,000,000; and the number of employees will be over 1,000,000.

Why is it, he remarked, that so many traders prefer transport by road to other means? It is because, in addition to the undoubted great economic advantage of a door-to-door service, enabling goods to be conveyed direct from factory to warehouse, and from producer to consumer, without bulk being broken, road transport has many other advantages, *e.g.*:

(*a*) Loading and unloading costs are considerably reduced, as two handlings only are necessary, compared with four or more by other systems.
(*b*) A great amount of time is saved in transit.
(*c*) There is a material reduction in packing expenses.
(*d*) The trader who hires has a choice of carrier.
(*e*) There is less damage caused by careless handling.
(*f*) The capital locked up in "empties" is reduced to a minimum, as they can be returned immediately.
(*g*) Loss due to pilfering is inconsiderable.
(*h*) Perishable goods are delivered in a sound condition.
(*i*) There is direct contact with the goods during transit, by buyer and seller.
(*j*) The advertising value of the road vehicle is very high.
(*k*) There is no complicated system of sidings.

On the subject of future development, Mr. Bristow suggested that six-wheeled vehicles and giant pneumatic tyres hold out great possibilities.

Stafford shows Substantial Increase.

The annual report of the Stafford gas undertaking shows the gross profit to be £13,500—an increase of £491 over the previous year. The increase in income from the sale of gas was £747; from residuals £7878, and from fittings £480, giving a total amount of £15,838; while there was an increase of £13,697 on the purchase of coal, and on repairs, &c., of £1650, making a total of £15,347. After deducting charges for service of department, income-tax, &c., the balance of net profit for the year stood at £6365, which, with a credit balance at the commencement of the year of £3013, gave a total of £9378. It was recommended that £2253 should be allocated to the reserve account, £2463 to renewals account, and £1503 to the appropriation account. The gas made for the twelve months was 346,674,000 c.ft., compared with 323,547,000 c.ft. last year—an increase of 23,127,000 c.ft., or 7·14 p.ct.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

Though quoted prices are not changed from the previous week, the market remains depressed, and trade is scarce. The low quotation of 14s. 6d. f.o.b. for Northumberland screened steams appears to be attracting more inquiry; but nothing like the required volume of orders is forthcoming as yet. Offers of all kinds of coal to the Continent are still met with counters at impossible prices. Best gas makes are moderately steady, but the output could be increased to meet a greater demand. One or two cargoes have been shipped to Montreal, but the effect of the American stoppage has so far been negligible; stocks in the country being very heavy.

Wear Special gas makes quote 17s. 6d. f.o.b., and best qualities are 17s. to 17s. 6d. Second-class gas is 15s. to 15s. 6d., according to bonus. Durham unscreened coking is weak at 15s. to 15s. 3d. nominal, but even best qualities have been done at slightly under 15s. Bunkers are 15s. 6d. to 16s. 6d. for good qualities.

Demand for coke of all kinds is slow, and gas makes are easier at 20s. to 21s. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

Gas coal inquiries in Yorkshire and Lancashire for forward delivery are being dealt with in accordance with the position at each supplying pit.

Collieries generally are working shorter time by reason of the lack of export business.

The industrial situation is spasmodic, some of the larger consuming trades not taking anything like normal tonnages. Prices for washed nuts are inclined to be discounted.

House coals move slowly; the public generally continuing to buy in small lots.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 18s. 6d. to 18s. 9d.; screened gas coal, 18s. 6d. to 19s. 6d.; washed trebles, 19s.; washed doubles, 18s. 3d. to 18s. 6d.; washed singles, 18s.; washed smalls, 15s. 9d. to 16s. 3d.; rough slack, 14s. 9d. to 15s.; smithy peas, 19s. 6d. to 20s. 6d. per ton. West Yorkshire—Hartley's (f.o.b. Goole), 16s. 6d. to 17s. 6d.; screened gas coal, 17s. 6d. to 18s. 6d.; washed trebles, 17s. 6d. to 18s.; washed doubles, 17s. 6d. to 18s.; washed smalls, 15s. 6d. to 16s.; unwashed trebles, 17s. to 17s. 6d.; unwashed doubles, 16s. to 17s.; rough slack, 14s. to 14s. 3d. per ton. Derbyshire and Nottinghamshire—Top hards, 21s. to 22s. 6d.; washed trebles, 19s. to 20s.; washed doubles, 18s. 3d. to 18s. 9d.; washed singles, 18s. to 18s. 3d.; washed smalls, 15s. 6d. to 16s.; unwashed doubles, 17s. to 18s.; rough slack, 14s. 6d. to 14s. 9d. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 16s. 6d. to 18s.; gas coke, 23s. 6d. to 27s. 6d.; furnace coke, 23s. to 25s. per ton.

MIDLANDS.

While the tendency of prices is to slacken, there is no definite readjustment. The only development of note is the offer of hard cokes on lower terms than those fixed for Midland blast furnaces at the end of the March quarter. Associated cokeries still acknowledge 22s. at the ovens as the basis. With an increasing output and a seasonal shrinkage of demand, furnacemen have been able to supplement supplies contracted-for over the second quarter with reinforcements at about 20s. There are indications that good orders might possibly be placed at even less than this figure. This is hailed as a significant portent for the iron trade, which has had to yield to the persistent demand for lower selling prices.

Consumers of industrial coal are still operating on the most cautious lines. There is no hope of stimulating local buying by any price concessions, which are compatible with the present costs of getting the coal; and collieries are chiefly concerned with adjusting output to current demand. Market conditions are easy, apart from slacks and smalls, which are being absorbed as they become available. There is no price tension in any department. Nutty slacks command from 9s. to 11s., pithead.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDERS.

Newhaven Gas and Coke Company, Ltd.

To authorize the Company to use scheduled land for gas purposes; to make provision as to the declaration of calorific value; to prescribe standard prices of gas and maximum or standard rates of dividend; to empower the Company to charge differential prices; to define and limit the share capital; and to make regulations governing the supply of gas.

Neyland Urban District Council.

To authorize the Council to take on lease lands, gas-works, and plant of the Great Western Railway Company in the urban district of Neyland; to charge a price for gas not exceeding 8s. 3d. per 1000 c.ft.; to make further provision with regard to the supply of gas; and to borrow money.

ORDER UNDER SECTION 1.

County Borough of Smethwick.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 3d. per therm.

POSITIVE RECORD

GAS CALORIMETER

(Simmance's Patent)

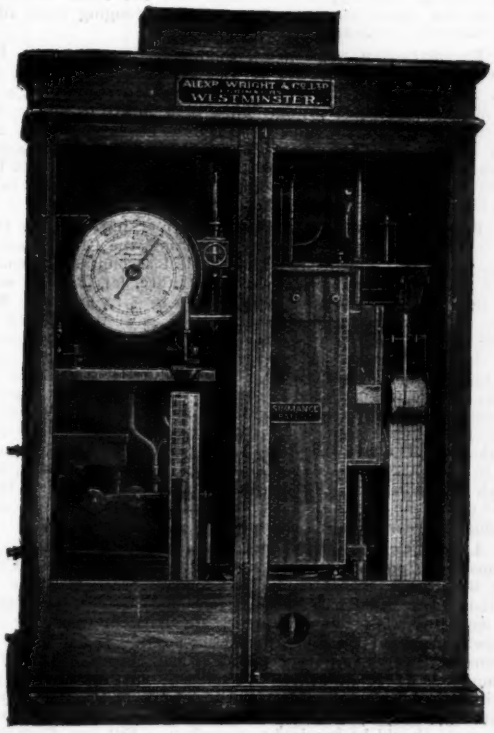
ACCURATE

No Water Troubles.

CERTAIN for a LONG RUN without attention.

A PERFECT TEST INSTRUMENT.
A PERFECT RECORDING MACHINE.
AN AUTOMATIC TESTER.

Maintenance Expense Avoided.



ALEXANDER WRIGHT & CO., Ltd., Westminster, S.W.1

Telephone: VICTORIA 1207. Telegrams: PRECISION, SOWEST, LONDON.

TRADE NOTES.

New Condensers for Belfast Gas-Works.

Out of eleven tenders for the supply and installation of three vertical water-cooled condensers of the latest type for dealing with gas produced by carburetted water gas plant at the gas-works, the Belfast Corporation have accepted that of Messrs. R. & J. Dempster, Ltd.

Large Contract for the Woodall-Duckham Company.

The Directors of the Nunnery Colliery Company, Ltd., of Sheffield, have placed an order with the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., for a complete coke oven works comprising a battery of 25 Becker ovens capable of carbonizing 3600 tons of slack per week. The contract includes the erection of semi-direct bye-product recovery plant, railway sidings, coal store, coal and coke handling plant, and coke screening plant.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *May* 9.

There is a moderate amount of inquiry for pitch, and the price remains steady at 75s. to 80s. per ton.

Creosote is unchanged at 8¾d. to 9d. per gallon.

Pure toluole is about 1s. 11d. per gallon, pure benzole about 1s. 8d. to 1s. 9d. per gallon, and 95/160 solvent naphtha about 1s. 6d. per gallon.

Phenol is a little quieter.

Tar Products in the Provinces.

May 9.

The average values of gas-works products during the week were: Gas-works tar, 54s. 6d. to 59s. 6d. Pitch—East Coast, 70s. to 75s. f.o.b. West Coast—Manchester, 67s. 6d. to 74s. 6d.; Liverpool, 70s. to 75s.; Clyde, 72s. 6d. to 75s. Benzole, 90 p.ct. North, 1s. 5d. to 1s. 6d.; crude, 65 p.ct. at 120° C., 1s. 0¼d. to 1s. 0¾d., naked at makers' works; 50-90 p.ct. naked, North, 1s. 6d. to 1s. 7d. Toluole, naked, North, 1s. 6¼d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 2¼d. to 1s. 3½d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, in bulk, North, liquid, 7½d. to 7¾d.; salty, 7¼d. to 7½d.; Scotland, 7½d. to 7¾d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 6d. prompt. Naphthalene, £11 to £14; salts £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Sunderland Gas Company Lowers Charges.—The Sunderland Gas Company have reduced the price of gas by 8d. per 1000 c.ft., from the quarterly meter readings taken in March and April. Slot meter users will receive a rebate of 1s. 2d. per 1000 c.ft. on all collections after May 2. The new gross price is 2s. 10d. per 1000 c.ft. for lighting, cooking, and heating, *less* the usual discounts, and 2s. 8d. for power purposes, *less* discounts ranging from 1d. to 7d. per 1000 c.ft., according to consumption.

Reconstruction at Bury St. Edmunds.—The Bury St. Edmunds Gas Company have decided to proceed immediately with a reconstruction scheme prepared and recommended by their Engineer, Mr. H. R. Wimhurst. Contracts have been placed with the Standard Furnace and Setting Company for a new retort bench and chimney, and with Messrs. Aldridge & Rankin, Ltd., for retort house framework, stoking machine, electrical generating plant, and the improved Congdon patent scrubber standpipe system. The Engineer is building the foundations by direct labour.

Belfast Accounts Show Successful Working.—In his report on the accounts of the Belfast gas undertaking, the Government Auditor (Mr. G. Bryan) states that in the capital account an expenditure of £53,230 brings the total capital expenditure, *less* amount written-off for depreciation and plant scrapped, up to £1,799,420 at March 31 last. The capital indebtedness remains, as at the close of the previous year, at £948,155. In the revenue account the gross profit on the manufacture and sale of gas and residuals amounted to £115,527, as compared with a profit of £110,671 for the previous year. There was a loss of £2480 on the stoves repair branch. The contingent renewal reserve fund was augmented by £3948, and the insurance reserve fund by £2934, bringing the total accumulation in these funds on March 31 up to £23,699 and £33,881 respectively. As in previous years, the dividends and sinking fund contribution to stock issued for the erection and completion of the City Hall were paid out of the profits of the gas undertaking; the amount so applied during the year under review totalling £11,432.

London County Council and the Commercial Gas Bill.—The Parliamentary Committee, reporting to the London County Council on the Bill of the Commercial Gas Company, state that the Bill was introduced in the House of Commons and they caused a petition to be deposited against it. As the result of negotiations, the Company agreed to amend the Bill by substituting a basic price of 11d. per therm for that of 11·4d. per therm, to omit the power sought to distribute among employee co-partners a minimum bonus of 3 p.ct. of their basic salaries or wages, and to substitute the year 1932 for the year 1937, as proposed in the Bill, as the latest year in which the Company should be required to introduce a Bill into Parliament proposing or affording an opportunity for revision of the basic price. The Company also gave an assurance that they would not take advantage of the powers in the Bill to pay unreasonable or excessive dividends, and undertook to withdraw from the Bill clause 31, which was to enable them to lay down and maintain mains, pipes, and culverts for oil or other material. In the circumstances, the petition was withdrawn.

CONTRACTS OPEN.

Coal.

The Teignmouth Urban District Council are inviting tenders for the supply of gas coal. [See advert. on p. 394.]

Tenders for the supply of gas coal are invited by the Skipton Urban District Council. [See advert. on p. 394.]

Tenders for the supply of gas fuel are invited by the City of Stoke-on-Trent Gas Department. [See advert. on p. 394.]

The Gas Committee of the Borough of East Retford are inviting tenders for the supply of gas coal. [See advert. on p. 394.]

Tenders are invited by the Directors of the Swindon United Gas Company for the supply of gas nuts. [See advert. on p. 394.]

The Gas Department of the Lisburn Urban District Council are inviting tenders for the supply of gas coal. [See advert. on p. 394.]

Reduction in Price at Devizes.—The price of gas has been reduced by the Devizes Corporation 9d. per 1000 c.ft., as from the March reading of the meters.

Price of Gas Reduced at Penzance.—The Penzance Gas Company, Ltd., have announced a reduction in the price gas of 6d. per 1000 c.ft., as from the readings of the meters on June 30 next.

Price Reductions in Scotland.—At Airdrie the price of gas has been reduced by 9d. per 1000 c.ft. The charge is now 2·1d. per therm. The price at Buckhaven has been reduced by 1s. 3d. per 1000 c.ft., which makes it 6s. 3d. In Buckie a reduction of 5d. per 1000 c.ft. has taken place. The Dunfermline Town Council recommend that the price be reduced by 1s. per 1000 c.ft.

Fire at the Meter Works of George Glover & Co.—A fire occurred about 3 o'clock on the morning of Wednesday, May 4, at the Meter Works of Messrs. George Glover & Co., King's Road, Chelsea. Two floors in part of the building were damaged, but it is satisfactory to know that the principal part of the factory is intact, and that last Monday the whole of the employees were at work again. It has not yet been possible to ascertain how the fire originated. It was discovered by the night watchman; and the Fire Brigade were quickly on the spot. By their efforts the fire was prevented from spreading to other parts of the factory or to adjoining buildings. Messrs. George Glover & Co. wish us to say how very much they appreciate the numerous kind inquiries and the offers of assistance which have come from meter manufacturers and other friends.

Meter Testing in Birmingham.—The Gas Meter Testing Committee of the Birmingham Justices, in their report for the year ended March last, state that the number of meters tested during the year was 116,136, as against 120,183 in the previous year. The decrease is more than accounted for owing to one local firm of meter makers being compelled by the terms of the contract with a London gas undertaking to have all the meters made for them tested in London. This alone made a difference of over 18,000 meters being submitted for testing. The loss has been met to a considerable extent by increased deliveries from other local makers, thus reducing the decrease on the year to 4047 only. The fees received were lower by £239. The income during the year amounted to £6820; and there was again a contribution to the rates of the city of £3728.

Montevideo Gas and Dry Dock Company, Ltd.—The annual meeting of the Company will be held on Tuesday, May 17, when the Directors will report a balance at net revenue account of £52,996. An interim dividend of 2½ p.ct., free of tax, has been paid for the half-year to June 30; and the Directors will recommend the payment of a final dividend of 3½ p.ct., free of tax, making the dividend for the year 6 p.ct., and leaving a balance of £20,481 to be carried forward. Compared with the previous year, gas sales show an increase of 6·04 p.ct.; while the number of meters in use has increased by 6·14 p.ct. A new gasholder was completed and brought into action early in June, 1926; and the laying of larger trunk and district mains has been continued. The Directors regret to announce that their esteemed colleague, Mr. Charles Hunt, formerly Chairman of the Company, has retired, owing to advancing years. The vacancy on the Board has been filled by the election of Mr. Cecil Constantine Malley.

South African Lighting Association, Ltd.—At the annual meeting of the Association on Wednesday, May 18, the Directors will report a considerable improvement in profits for the year 1926. The works at Port Elizabeth are now in a state of improved efficiency and repair; and the most important part of this overhaul has been completed during 1926, and the expenditure charged to the renewal fund created for the purpose. At Port Elizabeth the sale of gas per ton of coal shows a marked improvement; and the leakage has been reduced to a reasonable proportion of the make; and at Grahamstown, despite the strong competition from the municipal electricity undertaking, the Association during the past year has more than held its own. After payment of income-tax in the United Kingdom and debenture interest, there remains a balance on profit and loss account, including the sum of £4386 brought forward from 1925, of £7626. Out of this the Directors recommend the payment of a dividend for the year at the rate of 3 p.ct., less income-tax at 2s. in the pound, which will leave to be carried forward the sum of £4926.

The price of gas at Stafford will be reduced by 2d. per 1000 c.ft., as from the June meter readings.

At the last Darlaston Urban District Council meeting Mr. Hall asked that details should be obtained of the cost of automatic lighting. He understood that under the present system of lamplighters there was a big waste of gas before dark. Mr. C. Foster replied that information was being sought; and if the automatic system was practicable steps would be taken to put it into practice.

STOCK MARKET REPORT.

In confident anticipation of a further reduction in the Bank Rate, business on the Stock Exchange last week was again above the normal. Gilt-edged securities were mostly in demand, and Home Government stocks, particularly the new Consols and the Conversion loans, were very firm.

While Industrial shares were somewhat irregular, there were a few bright spots. The close connection of Messrs. W. Cory & Son with the gas industry will ensure attention to the activity at the present time in that Company's shares, the value of which on their good report rose to 57s. 6d. Other shares in the Iron, Coal, and Steel section, and also Artificial Silks, received considerable attention.

Slowly and surely the quotations of Gas Stocks continue to improve. It will be seen from the Table that during the week the stocks or shares of nine companies have been marked up. The Gas Light ordinary dropped ½ to 86½-88½, which probably was due to the brief but irritating newspaper "stunt." The circular to the South Suburban stockholders containing the offer under the arrangement with the South Metropolitan Company, whereby holders of the South Suburban ordinary stock will receive 6 p.c. preference stock in the South Metropolitan Company, was sent out during the week-end; and it is possible that the result will be known before this article is published. The adequacy of the compensation for the present loss of ½ p.c. in the interest is obvious when comparisons are made with the preference stocks of other companies. On a 6 p.c. basis the market quotation of such shares is 114, whereas the present average price of the South Suburban ordinary stock is 103¼. The offer will be closed when the amount required (£500,000) has been reached.

Issue.	Share.	When ex-Dividend.	Dividends, Prev. Hf.Yr	Dividends, Last Hf. Yr.	NAME,	Quotations. May 6.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 10	5	5	Aldershot 5 p.c. max. C.	70—73	..	
369,992	"	"	4	4	Do. 4 p.c. Pref.	68—71	..	..
1,661,868	"	Apl. 7	6¼	7	Alliance & Dublin Ord.	88—86	..	..
374,000	"	Jan. 13	4	4	Do. 4 p.c. Deb.	85—88	..	84—85½
300,000	1	Apl. 28	1/7½	1/7½	Bombay, Ltd.	1—1½*	..	..
170,000	10	Mar. 10	8½	8½	Bournemouth 5 p.c.	121—13½	..	21/3
600,050	10	"	7	7	Do. B 7 p.c.	11½—12½	..	12½—13⅛
275,000	10	"	6	6	Do. Pref. 6 p.c.	10½—11½	..	12½—12⅝
50,000	Stk.	Jan. 13	3	3	Do. 3 p.c. Deb.	85—86	..	..
162,025	"	"	4	4	Do. 4 p.c. Deb.	75—78	..	..
367,900	"	—	—	—	Brighton & Hove 5 p.c. Con.	100—106	+2	76½—77½
341,800	"	—	—	—	Do. 5 p.c. Con.	90—95	..	..
1,397,500	"	Feb. 24	5	5	Bristol 5 p.c. max.	89—90a	..	94½
855,000	"	Mar. 24	8	7	British Ord.	105—108	+1	..
100,000	"	Dec. 30	7	7	Do. 7 p.c. Pref.	112—117	..	107¾—107¾
120,000	"	"	4	4	Do. 4 p.c. Red. Deb.	75—80	..	115½
100,000	10	Dec. 9	8	6	Cape Town, Ltd.	7½—8½	..	76½
180,000	10	Apl. 28	4½	4½	Do. 4½ p.c. Pref.	6—7*	+½	8
180,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb.	..	..	..
886,860	"	Feb. 24	6	6	Cardiff Con. Ord.	68—78	..	70
227,960	"	Dec. 30	7¼	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
157,150	"	Feb. 24	5	6¼	Chester 5 p.c. Ord.	100—108	..	..
79,185	1	Apl. 28	†2/-	†2/-	Colombo Ltd. Ord.	86½—91½b	..	..
24,495	1	"	1/4‡	1/4‡	Do. 7 p.c. Pref.	26/—28/*	..	..
331,490	1	Apl. 7	1/9‡	1/9‡	Colonial Gas Assn. Ld. Ord.	20/—22/*	..	..
178,900	1	"	1/7‡	1/7‡	Do. 8 p.c. Pref.	24/6—26/6	..	..
1,518,280	Stk.	Feb. 24	5½	5½	Commercial 4 p.c. Cap.	20/—22/-	..	..
580,000	"	"	5/3¾	5/3¾	Do. 3½ p.c. Cap.	85—98	..	..
475,000	"	Dec. 30	8	8	Do 3 p.c. Deb.	84—87	..	86½
600,000	"	Sept. 30	12	11	Continental Union, Ltd.	54—57	..	85½
200,000	"	Mar. 10	7	7	Do. 7 p.c. Pref.	28—38	..	55
787,580	"	Mar. 10	6¼	6¼	Croydon sliding scale	79—82	..	81
408,100	"	"	5	5	Do. max. div.	96—99	..	97—97½
492,270	"	Feb. 24	8	9	Derby Con.	77—80	..	..
55,000	"	Dec. 30	4	4	Do. Deb.	104—106e	..	..
399,000	"	Mar. 10	5	5	East Hull Ord. 5 p.c.	78—75e	..	..
50,000	"	Dec. 30	5	5	Eastbourne 5 p.c. Deb.	76—80	..	..
1,002,180	10	Mar. 24	†8	†8	European, Ltd.	92—97	..	..
18,747,460	Stk.	Feb. 10	5/1¼	5	Gas Light & Coke 4 p.c. Ord.	52—62	..	..
2,400,000	"	"	8½	8½	Do. 3½ p.c. max.	86½—88½	−½	62⅜—62⅝
4,187,020	"	"	4	4	Do. 4 p.c. Con. Pref.	59—61	..	86¼—87⅜
5,602,620	"	Dec. 30	8	8	Do. 3 p.c. Con. Deb.	76—78	..	60⅜—61
2181,815	"	"	—	6	Do. 6 p.c. Br'tf'd Rd. Db.	58—60	..	76¼—77
1,642,770	"	"	—	5	Do. 5 p.c. Red. Deb.	100—105	..	59½—60
42,000	"	—	7½	7½	Do. 7½ p.c. Ilford Deb.	99—101	..	..
82,800	"	Mar. 10	6¾	6¾	Hastings & St L. 5 p.c. Conv	..	..	100⅜—100⅜
268,740	"	"	5¼	5¼	Do. 3½ p.c. Conv.	90—92	..	..
70,000	10	Apl. 28	†10	†10	Hongkong & China, Ltd.	67—72	..	..
173,200	Stk.	Mar. 10	5	5	Hornsey Con. 3½ p.c.	12—18*	..	..
1,976,000	"	Nov. 11	†10	10	Imperial Continental Cap.	67—69	..	..
223,130	"	Feb. 10	3½	3½	Do. 3½ p.c. Red. Deb.	141—144	..	..
235,242	"	Mar. 10	6¼	6¼	Lea Bridge 5 p.c. Ord.	69—71	+1	141½—143
3,145,907	"	Feb. 24	5¼	5¼	Liverpool 5 p.c. Ord.	92—97	..	..
600,000	"	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	83½—84½b	+½	..
165,786	"	Feb. 24	9	8	Maidstone 5 p.c. Cap.	102—104b	+1	84½—85
53,480	"	Dec. 30	8	8	Do. 8 p.c. Deb.	110—115	..	..
75,000	5	Dec. 9	†7	†7	Malta & Mediterranean	52—57	..	..
841,920	Stk.	Nov. 25	†5	†5	Montevideo, Ltd.	5½—5⅝	..	..
2,061,815	"	Feb. 24	5	5	Newcastle & Gateshead Con.	82—85	..	..
360,929	"	"	4	4	Do. 4 p.c. Pref.	74½—75½d	+1	100½
691,705	"	Dec. 30	8½	8½	Do. 3½ p.c. Deb.	68½—69½d	+½	103—103⅜
131,785	"	—	—	—	North Middlesex 6 p.c. Con.	68—69a	..	..
800,000	"	Apl. 28	9	7	Oriental, Ltd.	91—93	..	..
189,190	"	Dec. 30	7½	7½	Plym'th & Ston'house 5 p.c.	97—102*	..	..
414,500	"	Feb. 24	7½	7½	Portsm'th Con. Stk. 4 p.c. Std.	105—110	..	84½—85
236,732	"	"	5	5	Do. 5 p.c. max.	100—105	..	..
2,289,909	1	—	—	—	Primitiva Ord.	76—79	..	109½
282,200	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	15/3—16/3	+/-/3	103—103½
800,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	85—87	..	..
434,968	"	Dec. 30	4	4	Do. 4 p.c. Cons. Deb.	70—72	..	15/4½—15/10½
150,000	10	Mar. 24	6	6	San Paulo 6 p.c. Pref.	70—72	..	..
135,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	72—73	..	..
370,000	Stk.	Mar. 24	5½	5½	Sheffield A	47—50	..	71½
419,968	"	"	5½	5½	Do. B	95—97e*	..	..
1,047,000	"	"	5½	5½	Do. C	95—97e*	..	..
90,000	10	June 11	4	—	South African	95—97e*	..	..
6,809,895	Stk.	Feb. 24	5	7	South Met. Ord.	4—6	..	..
1,895,445	"	Jan. 13	8	8	Do. 3 p.c. Deb.	100—102	+½	100—101½
734,000	"	Mar. 10	6¼	6¼	Do. 6½ p.c. Red. Deb.	57—60	..	58½
91,500	"	Feb. 24	8½	8½	South Shields Con.	99—101	..	101
1,243,795	"	Mar. 10	6¼	6¼	South Suburban Ord. 6 p.c.	104—106d	−1	..
368,837	"	Dec. 30	5	5	Do. 5 p.c. Deb.	102—105	+1	102½—103½
647,740	"	Mar. 24	5	5	South'mpton Ord. 5 p.c. max.	93—96	..	96
191,275	"	Dec. 30	4	4	Do. 4 p.c. Deb.	74—77	..	75½—76½
250,000	"	Feb. 24	7	7	Swansea 7 p.c. Red. Pref.	68—78	..	..
200,000	"	Dec. 30	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	..
130,000	"	Feb. 24	7½	7½	Tottenham District A 5 p.c.	102—104	..	..
682,275	"	"	6½	6½	Do. B 3½ p.c.	105—110	..	..
150,000	"	"	5½	5½	Do. 5½ p.c. Pref.	89—92	..	..
181,255	"	Dec. 9	4	4	Do. 4 p.c. Deb.	97—100	..	90½—91½
268,251	"	Mar. 10	5	5	Tynemouth Con. and New	72—75	..	..
197,294	"	Mar. 10	6½	6½	Uxbridge, Maidenhead, &	69—71d	..	..
88,330	"	"	5	5	Wycombe 5 p.c.	..	..	..
91,800	"	"	6½	6½	Do. 5 p.c. pref.	85—90	..	..
					Do. 5 p.c. Maidenh'd	88—88	..	..
80,000	"	Mar. 10	8½	8½	Wandsworth, Wimbledon, and Epsom—	88—88	..	85
266,666	"	"	7	7	Wandsworth A 5 p.c.	120—125	..	..
432,635	"	"	5/19/0	5/19/0	Do. B 3½ p.c.	102—107	..	..
252,000	"	"	6¾	6¾	Do. C and New	90—95	..	..
96,000	"	"	7½	7½	Wimbledon 5 p.c.	98—103	..	..
88,416	"	Dec. 30	8	8	Epsom 5 p.c.	103—108	..	..
					3 p.c. Deb.	54—57	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex. div. † Paid free of income-tax ‡ Plus 8½ p.c. p.a. special dividend. § For year.

The following transactions were recorded during the week:

On Tuesday, Alliance and Dublin 84, Bournemouth 5 p.ct. 12⅜, 13, "B" 12⅜, British 4 p.ct. debenture 76½, Continental Union 31, Croydon sliding-scale 97, 97½, European 6½, 6 5/16, 6 7/16, 6⅜, Gas Light and Coke 87, 87½, 87⅜, 87½, 87⅜, 3½ p.ct. maximum 60¼, 4 p.ct. preference 77, 3 p.ct. debenture 59½, 59¾, 60, 5 p.ct. debenture 100⅜, Imperial Continental 143, Liverpool 7 p.ct. preference 101, Primitiva 15s. 4⅜d., 15s. 6d., 15s. 7½d., 15s. 10½d., South Metropolitan 100, 100⅜, 101, 3 p.ct. debenture 58⅜, 6½ p.ct. debenture 101, Southampton 75½, 76½, Tottenham "B" 91, 91½, Uxbridge 5 p.ct. preference 85. Supplementary prices, Ascot 6 p.ct. preference 10½, Barnet 5 p.ct. debenture 97½, Metropolitan (of Melbourne) 93⅜.

On Wednesday, Bombay 21s. 3d., British 107½, 107⅞, 7 p.ct. preference 115½, Commercial 3½ p.ct. 85½, European 6 15/16, Gas Light and Coke 87, 87¼, 87⅜, 3½ p.ct. maximum 60⅛, 4 p.ct. preference 76½, 77, Imperial Continental 141½, 142, 142½, Liverpool 7 p.ct. preference 101⅞, Newcastle 3½ p.ct. 74½, Primitiva 15s. 4½d., 15s. 6d., 15s. 9d., 15s. 10½d., 4 p.ct. consolidated debenture 71½. Supplementary prices, Liverpool 5 p.ct. 82¾, 85¼.

On Thursday, Brighton and Hove 5 p.ct. 94½, Cape Town 8, Commercial 4 p.ct. 86½, European 6 1/16, Gas Light and Coke 86⅜, 87, 87½, 3½ p.ct. maximum 60¼, 60⅜, 61, 4 p.ct. preference 76½, 3 p.ct. debenture 59⅜, 59⅞, 5 p.ct. debenture 100¼, 100⅜, Imperial Continental 141½, 143, Portsmouth 4 p.ct. 103, Primitiva 15s. 4½d., 15s. 6d., 15s. 7½d., 15s. 9d., 15s. 10½d., South Metropolitan, 100⅛, 101, South Suburban 5 p.ct. 102½, 103⅜, 5 p.ct. debenture 96, Tottenham "B" 90½. Supplementary prices, Ascot District 6 p.ct. preference 10½, Yorktown and Blackwater new 5 p.ct. preference 89.

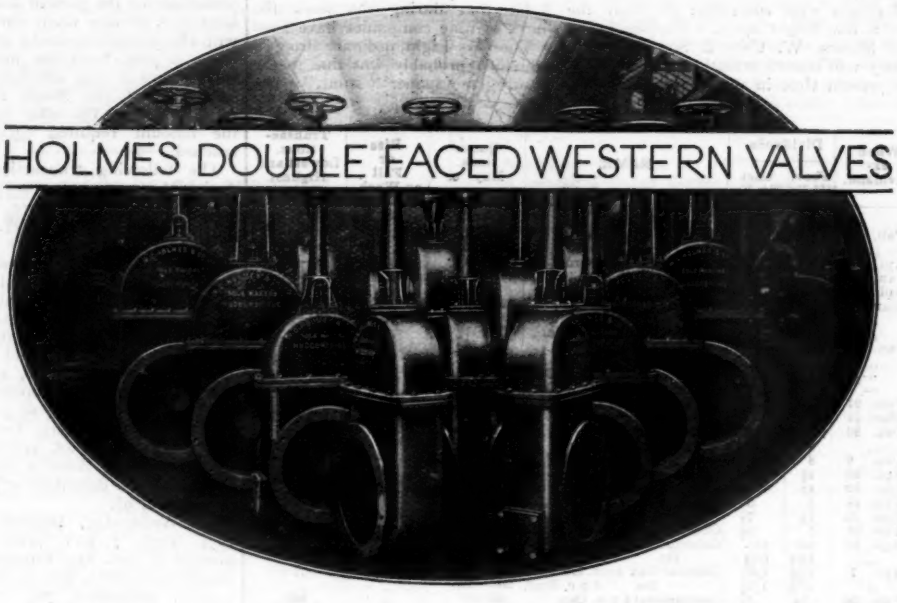
On Friday, Alliance and Dublin 85½, Bournemouth 5 p.ct. 12½, 13 1/16, "B" 12⅜, 12½, 12⅝, 4 p.ct. debenture 76½, 77½, British 107½, Cape Town 4½ p.ct. debenture 70, Commercial 3 p.ct. debenture 55, Continental Union 7 p.ct. preference 81, European 6 7/16, 6½, Gas Light and Coke 86½, 86⅞, 87, 87⅛, 87½, 87⅛, 4 p.ct. preference 76⅝, 3 p.ct. debenture 59½, Imperial Continental 141½, Plymouth and Stonehouse 5 p.ct. 109¼, Portsmouth 4 p.ct. 103⅜, Primitiva 15s. 4½d., 15s. 6d., 15s. 9d., South Metropolitan 100½, 101⅛, Tottenham 3½ p.ct. 90½. Supplementary prices, British 5 p.ct. debenture 97½, Liverpool 5 p.ct. 84, Rochester, Chatham 80⅜, 81¼.

While the recent large turnover of funds unsettled the monetary position in Lombard Street, conditions towards the end of the week were practically normal. Supplies became more plentiful; and although new money commanded 3⅝ p.ct., balances were obtainable as low as 3½ p.ct. Discount quotations displayed a downward tendency, the average rate at which Treasury Bills were allotted—£3 11s. 7·43d. p.ct.—having a weakening effect.

The feature of the Foreign Exchange Market was the recovery in Italian lire, the Milan rate closing at 92. The dollar-sterling was slightly weaker at 4.85 13/16. Pesetas finished lower at 27·47½; French francs remained at 124; Belgas moved against this country, and closed at 34·94½-34·95½.

Silver fell to 25 7/16d. per oz., and business was extremely quiet. Gold, of which a large amount is expected to be available this week, remained at 84s. 11d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21. Bankers' deposit rates are 2½ p.ct. The deposit rates of the discount houses are 2½ p.ct. at call and 2⅝ p.ct. at notice.



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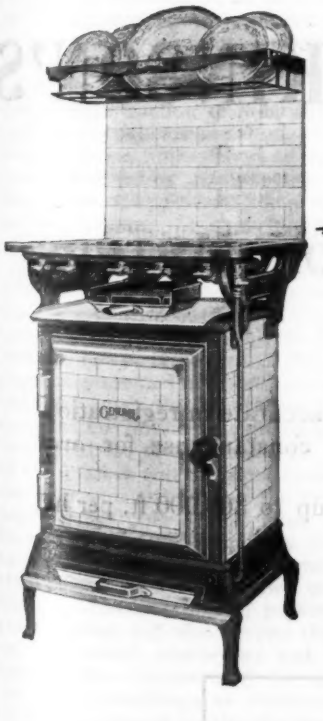

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